

Efficacy of Assessment of Respiratory Risk in Surgical Patients in Catalonia (ARISCAT) Score Versus Local Assessment of Ventilatory Management During General Anesthesia for Surgery (LAS VEGAS) Score in Predicting Postoperative Pulmonary Complications in Abdominal Surgeries: A Comparative Study

Hira Khurshid, Jmail Salamat, Afaq Ali, Wasim Ahmad, Muttahhar Asim, Sana Zahid

Department of General Surgery, Pak Emirates Military Hospital, Rawalpindi/National University of Medical Sciences (NUMS) Pakistan

ABSTRACT

Objective: To determine and compare the diagnostic accuracy of ARISCAT and LAS VEGAS scores in predicting postoperative pulmonary complications (PPCs) in patients undergoing surgery and to determine independent risk factors that are related to PPCs.

Study Design: Cross-sectional validation study.

Place and Duration of Study: PEMH, Rawalpindi, Pakistan, from Jan to Jun 2025.

Methodology: Demographic and clinical data of patients and comorbidities, BMI, type of surgery, and duration of surgery were gathered. PPCs were documented after surgery. ARISCAT and LAS VEGAS scores were computed and dichotomized into low and moderate/ high-risk. Diagnostic performance, sensitivity, specificity, PPV, NPV, and accuracy were taken into consideration when assessing the diagnostic performance. Chi-square test was applied to assess the association between different variables and postoperative pulmonary complications.

Results: Out of 186 patients, 78(41.9%) patients developed PPCs. The ARISCAT score had a sensitivity of 74.4%, specificity of 47.2%, PPV of 50.4%, NPV of 71.8%, and overall accuracy of 58.6%. LAS VEGAS score was lower, with a sensitivity of 66.7%, a specificity of 41.7%, a PPV of 45.2%, a NPV of 63.4%, and an accuracy of 52.2%. On bivariate analysis, diabetes mellitus ($p=0.035$) and ARISCAT score ($p=0.003$) showed a significant association with PPCs, while other variables were not statistically significant ($p>0.05$).

Conclusion: The ARISCAT score is better than the LAS VEGAS score in predicting PPCs. The inclusion of ARISCAT in perioperative evaluation could help to initially record those patients who can be at high risk and implement preemptive measures.

Keywords: ARISCAT, LAS VEGAS, Postoperative Pulmonary Complications, Risk assessment, Surgery.

How to Cite This Article: Khurshid H, Salamat J, Ali A, Ahmad W, Asim M, Zahid S. Efficacy of Assessment of Respiratory Risk in Surgical Patients in Catalonia (ARISCAT) Score Versus Local Assessment of Ventilatory Management During General Anesthesia for Surgery (LAS VEGAS) Score in Predicting Postoperative Pulmonary Complications in Abdominal Surgeries: A Comparative Study. *Pak Armed Forces Med J* 2026; 76(Suppl-8): S1313-S1318. DOI: <https://doi.org/10.51253/pafmj.v76iSUPPL-8.14219>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Postoperative pulmonary complications (PPCs) are the most common and significant adverse events in abdominal surgery.¹ These are clinically significant postoperative respiratory abnormalities hindering recovery. This general definition encompasses a continuum of disorders, mild conditions being limited to atelectasis or reversible bronchospasm, and severe, potentially fatal conditions being pneumonia and acute respiratory failure.^{2,3} PPCs are traditionally defined as atelectasis, bronchospasm, postoperative pneumonia, and exacerbation of the underlying chronic pulmonary diseases, all of which can contribute to the postoperative morbidity and

mortality.^{4,5}

There are multiple causes of postoperative pulmonary complications, including advanced age, existing comorbidities, the nature of the surgical procedure, the anesthesia technique and the patient's baseline pulmonary function.⁶ Recovery of normal pulmonary function after major surgery may be prolonged. Acute respiratory failure is a frequent and severe postoperative complication, often requiring mechanical ventilation and intensive care support.^{7,8}

Preoperatively, a series of diagnostic assessments and risk-characterization scoring systems are used to measure and forecast the probability of pulmonary problems following surgery.⁹ Respiratory Risk in Surgical Patients in Catalonia (ARISCAT) is a score that was developed from a large multicenter cohort and employs readily available factors to consider before surgery to estimate an individual's probability

Correspondence: Dr Hira Khurshid, Department of General Surgery, Pak Emirates Military Hospital, Rawalpindi Pakistan
Received: 19 Jan 2026; revision received: 25 Jan 2026; accepted: 14 May 2026

of developing PPCs. Conversely, the LAS VEGAS score, which was created based on the international LAS VEGAS observational study, incorporates a wider range of perioperative features, including patient comorbidities, intraoperative ventilatory and hemodynamics status, and it is aimed at reflecting both predisposition risk factors and intraoperative factors contributing to pulmonary injury.¹⁰

Despite the availability of both instruments, uncertainty remains regarding which approach, a parsimonious preoperative model (ARISCAT) or a more comprehensive perioperative model (LAS VEGAS) provides superior discrimination, calibration, and clinical usefulness in abdominal surgical populations. Thus, the purpose of this study is to directly compare the ARISCAT score and the LAS VEGAS score for the purpose of predicting PPCs in patients having abdominal procedures.

METHODOLOGY

After getting institutional review board approval (IERB Certificate No. A/28/ERC/163/25) and informed consent from all participants, this cross-sectional validation research was carried out at PEMH, Rawalpindi, Pakistan, from Jan to Jun 2025. A total of 186 patients undergoing elective or emergency abdominal surgeries under general anesthesia were enrolled in the study. The sample size was calculated using the WHO calculator (www.openepi.com), considering a diagnostic accuracy of 86% for the ARISCAT score with a 95% confidence level and 80% power, which yielded a minimum required sample of 186 patients.¹¹

Inclusion Criteria: Patients aged 18 to 70 years, of either sex, scheduled to undergo elective or emergency abdominal surgery under general anesthesia, and who provided written informed consent were included in the study.

Exclusion Criteria: Patients who had a history of severe pulmonary disease, had been put on long-term oxygen therapy, or had a previous thoracic surgery were excluded.

Basic demographics, medical comorbidities, smoking history, and preoperative pulmonary status were noted. Preoperative and perioperative ARISCAT and LAS VEGAS scores were calculated according to the existing criteria. Intraoperative variables were recorded: type and duration of surgery, technique of anesthesia, administration of neuromuscular blocking agents, and ventilation variables. The PPCs detected

within 7 days of surgery: atelectasis, pneumonia, bronchospasm, acute respiratory failure, or exacerbation of chronic lung disease were noted. In the patients who developed PPCs, the following investigations were carried out to assess the extent, including arterial blood gas analysis, oxygen saturation, and chest X-ray.

Preoperative ARISCAT and LAS VEGAS scores were calculated by the principal investigator using standardized published criteria. The ARISCAT score includes age, preoperative oxygen saturation, recent respiratory infection, anemia, surgical incision site, duration of surgery, and emergency surgery to stratify patients into low, moderate, and high-risk categories for postoperative pulmonary complications. The LAS VEGAS score incorporates patient characteristics, intraoperative ventilatory variables, and surgical factors to categorize PPC risk. To minimize observer and information bias, all scores were calculated by a single trained investigator, and objective data were obtained from anesthesia and operative records. Postoperative pulmonary complications were assessed using predefined diagnostic criteria within seven days of surgery.

To anticipate PPCs, the ARISCAT and LAS VEGAS scores were assessed in terms of diagnostic accuracy, sensitivity, specificity, PPV, and NPV. The quantitative variables were presented as median with interquartile range or mean and standard deviation, and the frequencies and percentages of the categorical factors.

Statistical Package for the Social Sciences version 25.0 was used to analyse data, after which the figures were presented. Mean $\pm$ SD were calculated for age and BMI. Frequency in percentage was calculated for gender, smoking status, hypertension, diabetes mellitus, preexisting pulmonary disease, and type of surgery. Chi-square test was applied to assess the association between different variables and postoperative pulmonary complications. To compare the predictive efficacy of the two scores, we compared their receiver operating characteristic (ROC) curves; we considered that a *p*-value below 0.05 was statistically significant.

RESULTS

The mean age of the 186 study participants was 54.72 $\pm$ 9.28 years. Most patients were below 60 years of age, 133(71.5%), while 53(28.5%) were older than 60 years. The study population comprised 116(62.4%) females and 70(37.6%) males. The mean body mass

index (BMI) was 26.89 ± 3.74 kg/m², with the majority of participants having a BMI > 25 kg/m² (123, 66.1%), while 63 (33.9%) had a BMI < 25 kg/m². Regarding smoking status, 140 (75.3%) patients were non-smokers, whereas 46(24.7%) were current smokers. Diabetes mellitus was present in 56 (30.1%) patients, while 130(69.9%) had no diabetes. Hypertension was observed in 80(43.0%) patients, whereas 106(57.0%) were normotensive. Pre-existing pulmonary disease was reported in 21(11.3%) patients, while 165(88.7%) had no known pulmonary comorbidity. Most surgeries were performed on an elective basis, 151(81.2%), while 35(18.8%) were emergency procedures. For preoperative pulmonary risk stratification, both ARISCAT and LAS VEGAS scoring systems were applied. According to the ARISCAT score, 54(29.0%) patients were categorized as low risk, 73(39.2%) as moderate risk, and 59(31.7%) as high risk. In comparison, the LAS VEGAS score classified 41(22.0%) patients as low risk, 75(40.3%) as moderate risk, and 70(37.6%) as high risk, as shown in Table-I.

Table-I: Demographic and health status of the participants at baseline (n=186)

Variable	Category	Frequency (%)
Gender	≤ 60 years	133 (71.5)
	> 60 years	53 (28.5)
	Male	70 (37.6)
	Female	116 (62.4)
	≤ 25 kg/m ²	63 (33.9)
Smoking status	> 25 kg/m ²	123 (66.1)
	No	140 (75.3)
Diabetes mellitus	Yes	46 (24.7)
	No	130 (69.9)
Hypertension	Yes	56 (30.1)
	No	106 (57.0)
Pre-existing pulmonary disease	Yes	80 (43.0)
	No	165 (88.7)
Type of surgery	Elective	21 (11.3)
	Emergency	151 (81.2)
ARISCAT score	Low	35 (18.8)
	Moderate	54 (29.0)
	High	73 (39.2)
LAS VEGAS score	Low	59 (31.7)
	Moderate	41 (22.0)
	High	75 (40.3)

*BMI – Body Mass Index, ARISCAT - Assessment of Respiratory Risk in Surgical Patients in Catalonia, LAS VEGAS Local Assessment of Ventilatory Management During General Anesthesia for Surgery

Postoperative pulmonary complications (PPCs) were observed in 78(41.9%) patients, while 108(58.1%) patients did not develop any PPC. These findings indicate a considerable burden of pulmonary morbidity following abdominal surgeries in the study population. Among the patients who developed PPCs, atelectasis was the most frequent complication

occurring in 54(29.0%) patients, followed by pneumonia in 20(10.8%), acute respiratory failure in 19(10.2%), and bronchospasm in 18(9.7%) patients. Exacerbation of pre-existing chronic lung disease was observed in 12(6.5%) patients. Overall, at least one form of postoperative pulmonary complication was observed in 78(41.9%) patients, as shown in Table-II.

Table-II: Incidence and Types of Postoperative Pulmonary Complications

Variables	Category	Frequency (%)
PPC status	No PPC	108 (58.1)
	Any PPC	78 (41.9)
Type of PPC	Atelectasis	54 (29.0)
	Pneumonia	20 (10.8)
	Bronchospasm	18 (9.7)
	Acute respiratory failure	19 (10.2)
	Exacerbation of chronic lung disease	12 (6.5)

*PPC = postoperative pulmonary complications

Receiver operating characteristic (ROC) analysis was performed to evaluate the discriminatory ability of the ARISCAT and LAS VEGAS scores for predicting postoperative pulmonary complications (PPCs). The ARISCAT score demonstrated statistically significant predictive performance with an area under the curve (AUC) of 0.623 (95% CI: 0.543–0.703; $p=0.004$). In contrast, the LAS VEGAS score showed an AUC of 0.498 (95% CI: 0.413–0.583; $p=0.958$), indicating no significant discriminative ability for predicting PPCs in the study population, as shown in Table-III.

Table-III: ROC Analysis for ARISCAT and LAS VEGAS Scores for Prediction of Postoperative Pulmonary Complications (PPCs)

Score	Area Under Curve (AUC)	Std. Error	95% CI	p-value
ARISCAT	0.623	0.041	0.543–0.703	0.004
LAS VEGAS	0.498	0.043	0.413–0.583	0.958

ROC = receiver operating characteristic; AUC = area under the curve; CI = confidence interval; PPCs = postoperative pulmonary complications

The ROC curve for the LAS VEGAS score showed limited discriminative capability in predicting postoperative pulmonary complications, with an AUC of 0.498, indicating no significant improvement over chance. The LAS VEGAS score demonstrated a sensitivity of 66.7% and a specificity of 41.7%. The positive predictive value was 45.2%, and the negative predictive value was 63.4%. The overall diagnostic accuracy was 52.2%, reflecting weaker predictive performance compared to the ARISCAT score in the present study population, given in Figure-1(a).

The ROC curve for the ARISCAT score demonstrated a modest discriminative ability for predicting postoperative pulmonary complications,

with an area under the curve (AUC) of 0.623, indicating performance better than chance. At the selected cut-off, the ARISCAT score showed a sensitivity of 74.4% and a specificity of 47.2%. The positive predictive value (PPV) was 50.4%, while the negative predictive value (NPV) was 71.8%. The overall diagnostic accuracy of the ARISCAT score was 58.6%, suggesting that it is more effective in identifying patients at risk for PPCs than ruling them out given in Figure-1(b).

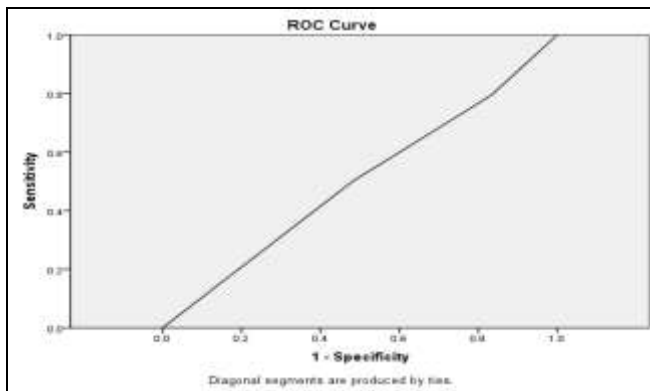


Figure-1(a): ROC curve of the LAS VEGAS Score for Predicting Postoperative Pulmonary Complications (PPCs). AUC = 0.498 (95% CI: 0.413–0.583, $p = 0.958$)

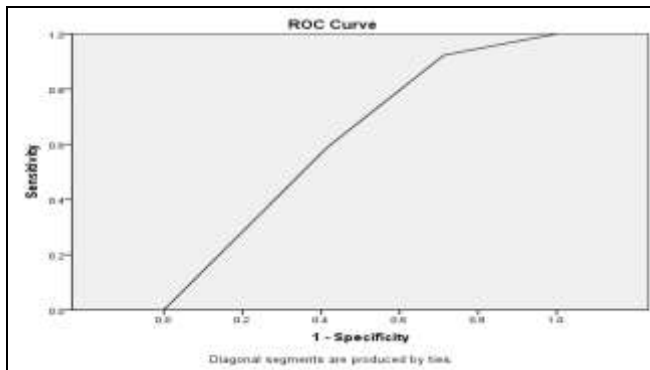


Figure-1(b): ROC curve of the ARISCAT score that Predicts Postoperative Pulmonary Complications (PPCs). AUC = 0.623 (95% CI: 0.543–0.703, $p = 0.004$)

On bivariate analysis, diabetes mellitus ($p=0.035$) and ARISCAT score ($p=0.003$) were significantly associated with postoperative pulmonary complications. A higher proportion of patients with PPCs had moderate to high ARISCAT scores (74.4%) compared to those without PPCs (52.8%). Similarly, diabetes mellitus was more frequent among patients with PPCs (38.5%) than those without PPCs (24.1%). Other variables, including age, gender, BMI, smoking status, hypertension, pulmonary disease, type of

surgery, duration of surgery, and LAS VEGAS score, did not show a statistically significant association ($p > 0.05$ (Table-IV)).

Table-IV: Association of Variables with Postoperative Pulmonary Complications (n=186)

Variables	Category	PPC Yes n(%)	PPC No n(%)	<i>p</i> - value
Age	≤60 years	54 (69.2)	79 (73.1)	0.116
	>60 years	24 (30.8)	29 (26.9)	
Gender	Male	30 (38.5)	40 (37.0)	0.614
	Female	48 (61.5)	68 (63.0)	
BMI	≤25 kg/m ²	22 (28.2)	41 (38.0)	0.165
	>25 kg/m ²	56 (71.8)	67 (62.0)	
Smoking	No	60 (76.9)	80 (74.1)	0.657
	Yes	18 (23.1)	28 (25.9)	
Diabetes Mellitus	No	48 (61.5)	82 (75.9)	0.035
	Yes	30 (38.5)	26 (24.1)	
Hypertension	No	40 (51.3)	66 (61.1)	0.287
	Yes	38 (48.7)	42 (38.9)	
Pulmonary Disease	No	68 (87.2)	97 (89.8)	0.575
	Yes	10 (12.8)	11 (10.2)	
Surgery Type	Elective	62 (79.5)	89 (82.4)	0.902
	Emergency	16 (20.5)	19 (17.6)	
ARISCAT Score	Low	20 (25.6)	51 (47.2)	0.003
	Moderate + High	58 (74.4)	57 (52.8)	
LAS VEGAS Score	Low	26 (33.3)	45 (41.7)	0.248
	Moderate + High	52 (66.7)	63 (58.3)	

BMI - Body Mass Index, ARISCAT - Assessment of Respiratory Risk in Surgical Patients in Catalonia, LAS VEGAS Local Assessment of Ventilatory Management During General Anesthesia for Surgery

DISCUSSION

Pulmonary complications (PPCs) occur postoperatively and are associated with high occurrence, morbidity, hospital stay, and health expenditure. In this study, postoperative pulmonary complications occurred in 41.9% of 186 patients undergoing abdominal surgery, with atelectasis being the most common. The ARISCAT score showed modest predictive ability (AUC=0.623), whereas the LAS VEGAS score had no significant predictive value (AUC=0.498). Age > 60 years, BMI > 25 kg/m², diabetes, pre-existing pulmonary disease, and moderate/high ARISCAT score were identified as independent predictors of complications. Other factors, including gender, smoking, hypertension, emergency surgery, prolonged operative time, and LAS VEGAS score, were not significant. These findings highlight the burden of PPCs and the relative superiority of ARISCAT in risk prediction.

Risk forecasting ratings are used to determine high-risk patients and apply preventive measures. ARISCAT score takes into consideration patient and surgery-related variables, whereas the LAS VEGAS score dwells on the intraoperative and perioperative variables.¹³ Correct forecasting of PPCs enables

interventions to be done in time, enhancing the postoperative outcomes. Although they are used, few comparative studies on the diagnostic power of these two scores are available.

In our study, 41.9% of patients developed PPCs, which is quite high in comparison with 10.9% by Neto *et al.*,¹⁴ but directly corresponds to 36.1% by Kokotovic *et al.*,¹³ The most prevalent PPCs within our population were atelectasis (29.0%) pneumonia (10.8%), bronchospasm (9.7%), and acute respiratory failure (10.2%), and this was the; same pattern as Siddiqui *et al.*,¹⁵ and Garg *et al.*,¹⁶ saw, where respiratory infections and pleural effusions were the most common.

In terms of predictive performance, our study revealed that the ARISCAT score had a sensitivity of 74.4, specificity of 47.2, PPV of 50.4, NPV of 71.8, and a diagnostic performance of 58.6, with the best cut-off value being 33.5 to identify high-risk patients. Our results reflect higher sensitivity but lower specificity than those of Sarma *et al.*, who found a sensitivity of 67.35 and specificity of 88.60, which alludes to the possibility that ARISCAT is overclassifying patients as at risk in our cohort but is nonetheless a useful tool to identify the majority of them as developing PPCs.¹¹ Kokotovic *et al.*, demonstrated good discrimination with an AUC of 0.83 (95% CI 0.790.86) in ARISCAT, and our study had a slightly lower AUC (0.623), which is probable because of sample differences and surgical case mix.¹³

In the LAS VEGAS case, we have observed the sensitivity, specificity, PPV, NPV, and diagnostic accuracy as 66.7, 41.7, 45.2, 63.4, and 52.2, respectively, which represent moderate discrimination. This is in line with Neto *et al.*, who posted an AUC of 0.78 in development and 0.72 in validation, which showed that the model has moderate predictive ability.¹⁴ Siddiqui *et al.*, had a very high sensitivity of ARISCAT (94.9) and LAS VEGAS (97.1) with very low specificity (4.65), indicating overprediction in cardiac surgery cases, which is also not in line with our more balanced result.¹⁵

Multivariate analysis indicated that age more than 60 years, BMI more than 25kg/m², diabetes mellitus, pre-existing pulmonary disease, and ARISCAT moderate/high risk were the significant predictors of PPCs, but LAS VEGAS moderate/ high risk (OR 1.43, $p=0.284$) was not. These results are in line with findings reported by Garg *et al.*, who focus on the role of comorbidity and surgical complexity.¹⁶

Our study is also consistent with the systematic review of Kouli *et al.*, who assessed 29 prognostic models of PPCs and discovered that none of the six externally validated models showed a strong discrimination (AUROC ≥ 0.70), and the best model showed a 0.700 (95% CI 0.6830.717) discrimination. This underscores the continuous requirement for quality and predictive tools that are effective.¹⁷ Lastly, Tilak *et al.*, found that PPC mortality rate (37.9) had moderate predictive characteristics, which aligns with our finding of a 26.5% mortality rate in PPC patients, supporting clinical implications of risk identification at the early stage.¹⁸

The study evaluated and compared the predictive performance of the ARISCAT and LAS VEGAS risk scores for postoperative pulmonary complications (PPCs), while simultaneously identifying the independent risk factors driving these adverse events. Our findings successfully addressed this objective, demonstrating that both scoring systems serve as robust tools for preoperative risk stratification, though subtle differences in their discriminative capacities exist. This clinical utility aligns consistently with contemporary literature, which underscores the necessity of utilizing validated predictive models to mitigate the burden of PPCs. Furthermore, the independent risk factors identified in our cohort echo established global surgical data, reinforcing the critical roles of patient-specific comorbidities and procedural characteristics in escalating pulmonary risk. Ultimately, this comparative analysis bridges existing knowledge gaps by providing a nuanced understanding of how these scores perform in diverse surgical populations, thereby empowering clinicians to implement targeted, preventive perioperative strategies.

LIMITATIONS OF STUDY

The study was carried out in one center only, so it cannot be generalized. Its sample size is sufficient, but it might not be able to identify rare complications. Moreover, the differences in perioperative management might have affected the outcomes even with the normal procedures.

CONCLUSION

Both ARISCAT and LAS VEGAS scores can predict pulmonary complications after surgery, with ARISCAT showing a higher level of discrimination. These scores may be used to risk-stratify and plan how to prevent the risk during the perioperative phase. Implementation of high-risk patient identification may improve surgical outcomes.

ACKNOWLEDGEMENT

The authors sincerely acknowledge the support and guidance of our mentors, colleagues, and the staff of the participating hospital for their valuable assistance throughout this study.

Conflict of Interest: None.

Discolure:

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

HK & IS: Data acquisition, data analysis, critical review, approval of the final version to be published.

AA & WA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MA & SZ: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

- He Q, Lai Z, Peng S, Lin S, Mo G, Zhao X, Wang Z. Postoperative pulmonary complications after major abdominal surgery in elderly patients and their association with patient-controlled analgesia. *BMC Geriatrics* 2024; 24(1): 751. <https://doi.org/10.1186/s12877-024-05337-y>
- Tuna ME, Akgün M. Preoperative pulmonary evaluation to prevent postoperative pulmonary complications. *Anesthesiol Perioper Sci* 2023; 1(4): 34. <https://doi.org/10.1007/s44254-023-00034-2>
- Lee HJ, Lee HW. Comprehensive Strategies for Preoperative Pulmonary Risk Evaluation and Management. *Tuberc Respir Dis* 2024; 88(1): 90. <https://doi.org/10.4046/trd.2024.0118>
- Cai BB, Wang DP. Risk factors for postoperative pulmonary complications in neonates: a retrospective cohort study. *World J Pediatr Surg* 2023; 6(4): e000657. <https://doi.org/10.1136/wjps-2023-000657>
- Lusquinhos J, Tavares M, Abelha F, Lusquinhos Sr J. Postoperative pulmonary complications and perioperative strategies: a systematic review. *Cureus* 2023; 15(5): 38786. <https://doi.org/10.7759/cureus.38786>
- Agrawal P. Study on postoperative pulmonary complications in patients who underwent upper abdominal surgery. *Int J Acad Med Pharm* 2023; 5(2): 1333-1339. <https://doi.org/10.47009/jamp.2023.5.2.281>
- Rosenberg J, Fuchs-Buder T. Deep Neuromuscular Blockade During General Anesthesia: Advantages, Challenges, and Future Directions. *Anesth Res* 2025; 2(2): 8. <https://www.mdpi.com/2813-5806/2/2/8#>
- Schwartz J, Parsey D, Mundangepfupfu T, Tsang S, Pranaat R, Wilson J, et al. Pre-operative patient optimization to prevent postoperative pulmonary complications-Insights and roles for the respiratory therapist: A narrative review. *Can J Respir Ther* 2020; 56: 79-85. <https://doi.org/10.29390/cjrt-2020-029>
- Nithiuthai J, Siriussawakul A, Junkai R, Horugsa N, Jarungitaree S, Triyasunant N. Do ARISCAT scores help to predict the incidence of postoperative pulmonary complications in elderly patients after upper abdominal surgery? An observational study at a single university hospital. *Periopr Med* 2021; 10(1): 43. <https://doi.org/10.1186/s13741-021-00214-3>
- Kamaluddin S, Salahuddin A, Adil A, Musba AM, Dat MD. Comparative validity of the Assess Respiratory Risk in Surgical Patients in Catalonia (ARISCAT) score and Surgical Lung Injury Prediction (SLIP-2) in predicting the incidence of postoperative pulmonary complications in thoracic surgery. *Critical Care Shock* 2025; 28(5).
- Sarma R, Bora M, Gohain M. Predictability of post-operative pulmonary complications in the subjects residing in upper Assam using the ARISCAT score. *Int J LifeSci Biotechnol Pharma Res* 2023; 12(4): 1160-1164.
- Ferrando-Ortolá C, Rodríguez A, Becerra Á, Cabrera S, Guerra E, Focaccio CA, et al. Postoperative pulmonary complications in emergency abdominal surgery. A prospective international cohort study. *Anaesth Critical Care Pain Med* 2025; 44(5): 101560. <https://doi.org/10.1016/j.accpm.2025.101560>
- Kokotovic D, Degett TH, Ekeloef S, Burcharth J. The ARISCAT score is a promising model to predict postoperative pulmonary complications after major emergency abdominal surgery: an external validation in a Danish cohort. *Euro J Trauma Emerg Surg* 2022; 48(5): 3863-3867. <https://doi.org/10.1007/s00068-021-01826-6>
- Neto AS, da Costa LG, Hemmes SN, Canet J, Hedenstierna G, Jaber S, et al. The LAS VEGAS risk score for prediction of postoperative pulmonary complications: an observational study. *European Journal of Anaesthesiology | EJA*. 2020; 35(9): 691-701. <https://doi.org/10.1097/EJA.0000000000000845>
- Siddiqui KM, Farooqui MH, Yousuf MS, Ali MA. ARISCAT and LAS VEGAS risk scores for predicting postoperative pulmonary complications after cardiac surgery: a cohort study. *Ann Med Surg* 2024; 86(7): 3873-3879. <https://doi.org/10.1097/MS9.0000000000002191>
- Garg S, Govindaraj V, Dwivedi DP, Raja K, Theerthar EP. Postoperative pulmonary complications in patients undergoing upper abdominal surgery: risk factors and predictive models. *Monaldi Arch Chest Dis* 2025; 95(1). <https://doi.org/10.4081/monaldi.2024.2915>
- Kouli O, Murray V, Bhatia S, Cambridge WA, Kawka M, Shafi S, et al. Evaluation of prognostic risk models for postoperative pulmonary complications in adult patients undergoing major abdominal surgery: a systematic review and international external validation cohort study. *Lancet Digit Health* 2022; 4(7): e520-e531. [https://doi.org/10.1016/S2589-7500\(22\)00069-3](https://doi.org/10.1016/S2589-7500(22)00069-3)
- Tilak KM, Litake MM, Shingada KV. Study of risk, incidence, and mortality associated with postoperative pulmonary complications using the Assess Respiratory Risk in Surgical Patients in Catalonia score. *Int Surg J* 2019; 6: 3215-3222. <http://dx.doi.org/10.18203/2349-2902.isj20194054>