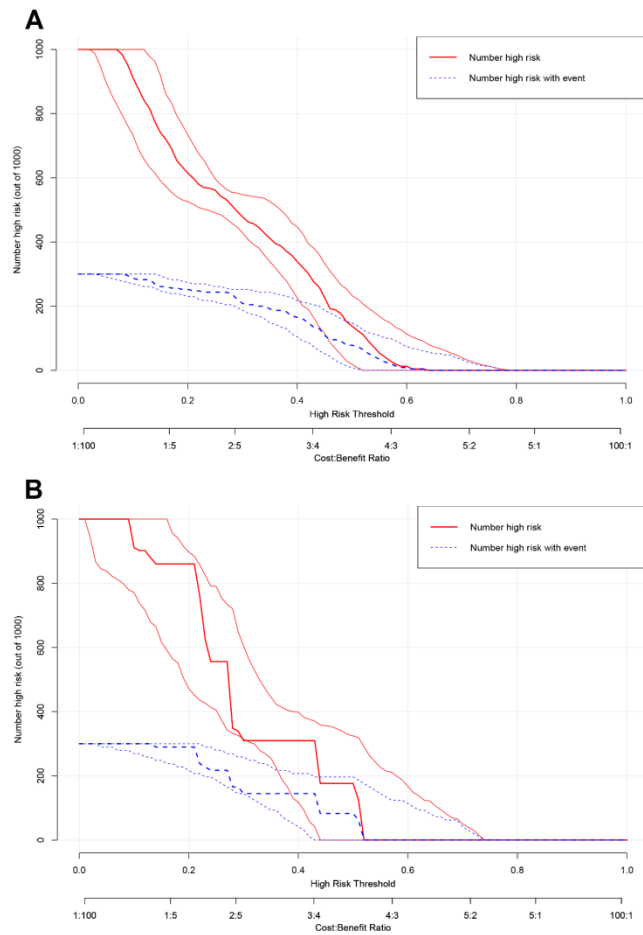


Supplementary Figure 1 Prediction performance of RFC model via CIC. A. Training set.B. Validation set.

Notes. The blue line predicts the probability of poor POPF, and the red line shows the possibility that the patient is at high risk of POPF.



Supplementary Table 1. The candidate variables screening associated with POPF via RFC algorithm.

Variables	Mean decrease accuracy	Mean decrease Gini
Gender	7.95E-36	6.64E-16
Age	1.734295532	0.006570824
Smoking	-1.000500375	6.44E-16
Drinking_history	4.00E-20	1.18E-15
BMI	7.752857419	1.160603853
Diabetes	1.876120666	0.197624078
Hypertension	-1.000500375	2.31E-15
Abdominal_operation	1.000500375	1.44E-15
AGR	1.401790734	0.112733826
Blood_transfusion	-4.46E-37	1.47E-15
Anemia	1.59E-36	2.11E-15
Lesion_size	-3.07E-36	4.73E-16
WBC	1.000500375	0.006128946
ASA	-2.82E-37	2.86E-15
CRP	16.20252423	10.79150889
Pancreatic_duct_diameter	5.391957774	0.248305508
PCT	14.58641932	7.795556509
Remnant_texture	7.993763406	1.008267889
NLR	2.493084773	0.031696064
Neutrophil_count	4.449507859	0.426070013
Lymphocyte_count	6.573470217	0.768947958
Platelet_count	4.678255669	0.199639767
Monocyte_count	3.262890782	0.036517628

Hemoglobin	1.414839013	0.010591206
PLR	12.89456443	4.433346142
NAR	27.4710452	25.70052591
LMR	3.46372971	0.099760135
PNI	9.251421528	1.740339183
HALP	28.62807236	27.76215888

Abbreviations: POPF. postoperative pancreatic fistula. BMI. body mass index. ASA.American Society of Anesthesiologists. CRP. C-reactive protein. WBC.white blood cell. PCT. Procalcitonin. AGR. albumin-to-globulin ratio. PNI. prognostic nutrition index. NLR. neutrophil-to-lymphocyte ratio. NAR. neutrophil-to-albumin ratio. PLR. platelet-to-lymphocyte ratio. LMR. lymphocyte-to-monocyte ratio. HALP. hemoglobin level * albumin level * lymphocyte count / platelet count ratio.

Supplementary Table 1 The predictive performances of different models associated with POPF

GL model	Multivariate analysis		Discrimination			
	OR(95%CI)	P-value	Brier	R ²	C-index	AIC
Model1						
Sex						
(Male vs Female)	1.25(0.68-1.82)	<0.05				
Age*,y	1.12(0.57-1.67)	<0.01				
Remnant texture						
(soft vs hard)	1.14(0.59-1.69)	<0.01				

Lesion size, cm						349.
(> 3 vs ≤3)	0.78(0.23-1.33)	<0.01	0.07	0.08	0.757	50
PNI	1.25(0.74-1.76)	<0.01				
NAR	1.35(0.82-1.88)	<0.01				
HALP	1.21(0.68-1.74)	<0.05				
NLR	1.59(1.06-2.12)	<0.01				
Model2						
Sex						
(Male vs Female)	1.32(0.79-1.85)	<0.01				
BMI,kg/m ²	1.07(0.50-1.64)	<0.01				
PCT	1.14(0.57-1.71)	<0.01				
Remnant texture						367.
(soft vs hard)	1.66(1.09-2.23)	<0.01	0.06	0.08	0.786	50
NAR	1.17(0.68-1.66)	<0.05				
PLR	1.46(0.97-1.95)	<0.01				
LMR	1.49(0.98-2.00)	<0.01				
Model3						
Sex						
(Male vs Female)	1.02(0.51-1.53)	<0.01				
BMI	1.31(0.80-1.82)	<0.05				
Remnant texture						
(soft vs hard)	1.57(1.01-2.13)	<0.01				
Pancreatic duct diamet	0.95(0.39-1.51)	<0.01	0.07	0.08	0.795	371.

er,mm
(<3 vs ≥3)

50

PNI	1.18(0.62-1.74)	<0.01
NAR	1.12(0.56-1.68)	<0.01
PLR	1.32(0.76-1.88)	<0.05

Notes. *. Continuous variable. AIC: Akaike information criterion. GL model: generalize linear model. OR: odds ratio. 95%CI: 95% confidence level.

Supplementary Table 3 The predictive ability and parameter inclusion of prediction models reported in previous literature

Title	Author	Parameters	Predicting outcomes	Methods	Predictive power
Risk Factors of Postoperative Clinically Relevant Pancreatic Fistula following Distal Pancreatectomy with Stapler Closure.	Ozyazici S, Erdogan O.2021	Age, Sex, Body mass index, Preoperative serum albumin, Disease, ASA level	Operative time, Intraoperative blood loss, Pancreatic texture, Type of surgery, Closure type	Chi-square test, Fisher's Exact test, Logistic regression test	Clinically relevant POPF rate 31.6%. The soft pancreatic texture is an independent risk factor for clinically relevant POPF(OR: 0.016, p = 0.039)
Abdominal drain amylase on the first day after pancreatectomy: a predictive factor for pancreatic fistula	Rosa, Pablo Henrique Brito da et al.2021	Age, Sex, Histopathological diagnosis, Complications, Abdominal collection, Deaths, Readmission, Number of days with drain, Number of days hospitalized, Surgical procedure, The drain on the first postoperative day	The diagnosis of PF exclusion	Fisher's exact test, the Chi-square test, Student's T-test, the Mann-Whitney non-parametric test	The 444 U/L value was the most satisfactory cutoff point: CI 0.690–0.941 (with a sensitivity of 94.4% and a specificity of 60%)
Preoperative risk stratification of postoperative pancreatic fistula: A risk-tree predictive model for pancreatoduodenectomy	Perri G, Marchegiani G, Partelli S, et al. 2021	Sex, Body mass index, Age at diagnosis, Smoker, Alcohol abuse, Diabetes, Weight loss, ASA score, MPD diameter	3 risk groups with significantly different postoperative pancreatic fistula risks	regression risk-tree model, the independent sample t test, the MannWhitney test	AUC 0.65 (95% CI, 0.59-0.71)

Comprehensive Diagnostic Nomogram for Predicting Clinically Relevant Postoperative Pancreatic Fistula After Pancreatoduodenectomy	Li B, Pu N, Chen Q, et al. 2021	MPD diameter, operation time, intraoperative bleeding, red blood cells (RBC), hemoglobin (HGB), white blood cells (WBC), platelets (PLT), neutrophils (NEUT), lymphocytes (LYM), monocytes (MO), CRP, PCT, albumin (ALB), total bilirubin (TBil), alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma-glutamyl transaminase (GGT), alkaline phosphatase (ALP), Creatinine (Cr), blood urea nitrogen (BUN), operative area drainage (OAD), and drain AMY	concordance index (C-index), calibration curve, decision curve analysis (DCA), and clinical impact curve (CIC)	Chi-square test, Fisher's exact test, Student's t-test, Mann-Whitney U test	predictive value concordance index 0.814 (95% CI, 0.736–0.892)
Use of alternative pancreatic fistula risk score system for patients with clinical relevant postoperative pancreatic fistula after laparoscopic pancreaticoduodenectomy	Niu, C Y et al. 2021	Age, Sex, Body mass index, CA19-9, CA125, pancreatic texture, main pancreatic duct diameter	incidence of CR-POPF	Univariate analysis and multivariate Logistic regression analysis	AUC 0.735(95%CI:0.668-0.799)
Risk factors and prevention of postoperative pancreatic fistula after insulinoma enucleation: a retrospective study from a high-volume center	Xu Q, Xie Q, Ge C, et al. 2021	Age, Sex, Surgery duration, Blood loss, Tumor size, Ki67 index, POPF Grading, Maximum drainage, Drainage time	incidence of CR-POPF	multivariable logistic regression model, Chi-square test, Fisher's exact test, Shapiro-Wilk test	distance from insulinoma to MPD ≤ 2 mm ($p = 0.003$, OR = 6.011, 95% CI 1.852–19.512)

The value of serum amylase and drain fluid amylase to predict postoperative pancreatic fistula after pancreaticoduodenectomy: a retrospective cohort study	van Dongen, Jelle C et al. 2021	Age, Male sex, BMI, ASA status, Diabetes mellitus, Neoadjuvant therapy, pathology, Preoperative biliary drainage, Pancreatic duct diameter, pancreatic texture, Intra-operative blood loss, CRP on POD 3, Days to drain removal in days, Length of hospital stay	Risk of grade B/C POPF	T-test, Mann-Whitney U test, the chi-squared test, Fisher's exact test,	AUC: 0.82
Drain output volume after pancreaticoduodenectomy is a useful warning sign for postoperative complications	Fukui, Taro et al. 2021	Age, Gender, Diseases, BMI, Preoperative biliary drainage, Preoperative hemoglobin,	incidence of CR-POPF	Mann-Whitney U test, Spearman's rank correlation coefficient analysis, multivariable logistic regression analysis	AUC 0.655, 95% CI: 0.587–0.724
Predictive nomogram for postoperative pancreatic fistula following pancreaticoduodenectomy: a retrospective study	Shen J, Guo F, Sun Y, et al. 2021	Age, Sex, Body mass index, Smoking, Drinking, Biliary drainage, Diabetes, Hypertension, Epigastric operation history, Total bilirubin, Albumin, Operative time, Pancreas duct size, Pancreas texture, Pathology, Tumour location, Data on POD 1	POPF rate	t-test, Mann-Whitney U test, chi-squared test, Fisher's exact test, Lasso regression, multivariable logistic regression analysis	AUC 0.87, 95% CI: 0.81–0.94
Preoperative prediction of clinically relevant postoperative pancreatic fistula after pancreaticoduodenectomy	Lin, Ziyang et al. 2021	Age, Gender, Diabetes mellitus, Hypertension, Smoking history, Alcohol consumption, surgical procedures, Pathological diagnosis, Clinical	preoperative prediction of CR-POPF	Independent t test, chi-square test, ROC analysis	radiomics model: AUC 0.871 (95% CI 0.816, 0.926), combined model: AUC 0.869 (95% CI 0.779, 0.958)

		outcome			
Post-operative procalcitonin and C-reactive protein predict pancreatic fistula after laparoscopic pancreaticoduodenectomy	Ma, Jie et al. 2021	Age, Gender, BMI, Diabetes, History of abdominal operation, Obstructive jaundice, Pre-operative biliary drainage, Serum albumin, Hemoglobin, Operation time, Operation time, Pathology, Pancreatic gland texture, Pancreatic duct diameter, Pathologic type	CRPF development	Mann–Whitney U test, Chi-square test, Fisher's exact test, logistic regression analysis	POD 3 (AUC 0.951; sensitivity 88.2%, specificity 92.9%, $P<0.001$)
A simple preoperative stratification tool predicting the risk of postoperative pancreatic fistula after pancreaticoduodenectomy	Lapshyn, Hryhoriy et al. 2021	Age, Gender, BMI, PVR, Pancreatic texture, Pancreatic anastomosis, Histological diagnosis, 90 days postoperative mortality,	risk of developing grade B/C POPF	Chi-squared test, Fisher's exact test, Mann-Whitney-U-test	training cohort: AUC 0.808 (95%CI 0.726-0.874), independent test cohort: AUC 0.756 (95%CI 0.669-0.830)
Predictive factors of postoperative pancreatic fistula after laparoscopic pancreaticoduodenectomy	Jin, Jikuan et al. 2021	Gender, Age, BMI, Preoperative comorbidities, Pancreatitis history, Abdominal surgery history, Preoperative biliary drainage, Pathology	POPF rate, morbidity incidence	Chi-squared test, Fisher's exact test, Mann-Whitney U-test	pancreatic texture: AUC =0.854, pancreatic texture + pancreatic duct width: AUC =0.904
Dynamic prediction for clinically relevant pancreatic fistula: a novel prediction model for laparoscopic pancreaticoduodenectomy	Liu, Runwen et al. 2021	Operation age, Gender, Body mass index, Smoking, Drinking, History of hypertension, History of diabetes, Total bilirubin, Albumin, Blood urea nitrogen, ASA grading, Operation time, Preoperative biliary drainage, Intraoperative blood loss,	Risk of POPF	chi-squared test, independent t-test, Mann–Whitney U rank-sum test, logistics regression model	AUC of postoperative days 2, 3, and 5 was 0.866 (95% CI 0.737–0.996), 0.896 (95% CI 0.814–0.978), and 0.888 (95% CI 0.806–0.971), respectively.

		Dissection and reconstruction of vessels, Texture of pancreas, Pan creatic Duct's diameter			
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