

SUPPLEMENTAL MATERIALS

Table S1. Comparison of baseline demographic and clinical characteristics of patients undergoing appendectomy or laparoscopic cholecystectomy with and without preoperative glucose level measurements.

Table S2. Covariates assessed in the current study.

Table S3. Missing rate of data on demographic and clinical characteristics of patients undergoing appendectomy or laparoscopic cholecystectomy.

Table S4. Baseline demographic and clinical characteristics of patients undergoing appendectomy or laparoscopic cholecystectomy.

Table S5. Baseline demographic and clinical characteristics of patients undergoing emergent appendectomy or elective laparoscopic cholecystectomy.

Table S6. Odds ratio (OR) for a hospital length-of-stay (LOS) of >3 days according to preoperative blood glucose level modeled on a continuous scale, in tertile groups, and with a clinical cutoff.

Table S7. Relative risk (RR) for a hospital length-of-stay (LOS) of >3 days according to preoperative blood glucose level on a continuous scale, in tertile groups, and with a clinical cutoff using Model 4 (full model).

Figure S1. Flow diagram for the study population selection process.

Figure S2. Correlation plots between preoperative glucose and postoperative glucose ($n = 255$ for appendectomy group and $n = 929$ for laparoscopic cholecystectomy group).

Figure S3. Discrimination and calibration performance of the seven-variable reference model and models with preoperative glucose in predicting a hospital length of stay of >3 days. The seven-variable reference model included age, sex, diabetes, hypertension, cardiovascular disease, white blood cell (WBC) count, and neutrophil-to-lymphocyte ratio (NLR).

(A) Receiver operating characteristic (ROC) curves for predicting a hospital length of stay of >3 days after incorporation of preoperative glucose level on a continuous scale or in tertile groups into the seven-variable reference model. For both appendectomy and cholecystectomy, P values for a comparison of the seven-variable reference model with the eight-variable model with preoperative glucose levels on a continuous scale or in tertile groups were all <0.05 .

(B) Calibration plots for predicting a length of hospital stay of >3 days after incorporation of preoperative glucose level on a continuous scale or in tertile groups into the seven-variable reference model.

Figure S4. Correlation plots between preoperative glucose, white blood cell (WBC) count, neutrophil-to-lymphocyte ratio (NLR), and C-reactive protein (CRP).

Figure S5. Directed acyclic graph (DAG) of the causal pathways between preoperative blood glucose and prolonged hospitalization among surgical patients.

(A) Unadjusted DAG

(B) DAG adjusted for age, diabetes, hypertension, cardiovascular disease, American Society of Anesthesiologists (ASA) score, wound class, operation duration, and surgical drain.

Table S1. Comparison of baseline demographic and clinical characteristics of patients undergoing appendectomy or laparoscopic cholecystectomy with and without preoperative glucose level measurements.

	Appendectomy			Laparoscopic cholecystectomy		
	Study population (n= 4025)	Patients without pre-operative glucose (n= 343) [†]	P-value*	Study population (n= 4266)	Patients without pre-operative glucose (n= 1602) [†]	P-value*
Age (years), median (IQR)	38.0 (27.8, 51.8)	38.1 (28.2, 51.7)	0.819	53.4 (41.1, 65.5)	52.3 (39.4, 65.0)	0.069
Age ≥ 65, n (%)	408 (10.14)	32 (9.33)	0.634	1114 (26.11)	400 (24.97)	0.372
Female, n (%)	1956 (48.60)	167 (48.69)	0.974	2268 (53.16)	847 (52.87)	0.841
Diabetes mellitus, n (%)	240 (5.96)	7 (2.04)	0.003	889 (20.84)	88 (5.49)	<0.001
Hypertension, n (%)	129 (3.20)	16 (4.66)	0.147	497 (11.65)	200 (12.48)	0.379
Cardiovascular disease, n (%)	212 (5.27)	24 (7.00)	0.174	461 (10.81)	202 (12.61)	0.052
ASA score, median (IQR)	1.00 (1.00, 2.00)	1.00 (1.00, 2.00)	0.975	2.00 (2.00, 2.00)	2.00 (2.00, 2.00)	0.984
ASA score ≥ 3, n (%)	290 (8.52)	28 (9.66)	0.508	657 (17.24)	233 (16.31)	0.420
Operation duration (minute), median (IQR)	55.0 (40.0, 70.0)	60.0 (43.0, 79.0)	0.002	85.0 (65.0, 111.0)	85.0 (64.0, 115.0)	0.949
> 75 th percentile, n (%) [‡]	985 (24.47)	116 (33.82)	<0.001	1062 (24.89)	421 (26.28)	0.277
EBL (c.c.), median (IQR)	2.20 (1.69, 3.40)	20.0 (20.0, 20.0)	0.363	20.0 (20.0, 20.0)	20.0 (20.0, 20.0)	0.131
Wound class, n (%)			0.026			<0.001
Clean	129 (3.90)	21 (7.27)		550 (14.69)	155 (11.10)	
Clean Contaminated	2331 (70.42)	194 (67.13)		2691 (71.88)	1093 (78.30)	
Contaminated	700 (21.15)	67 (23.18)		495 (13.22)	146 (10.46)	
Dirty	150 (4.53)	7 (2.42)		8 (0.21)	2 (0.14)	
Emergent, n (%)	3136 (91.48)	212 (71.62)	<0.001	1118 (29.23)	180 (12.53)	<0.001
Drain, n (%)	904 (22.46)	79 (23.03)	0.808	1893 (44.37)	649 (40.51)	0.008
Surgeon's age, median (IQR)	36.6 (34.4, 39.1)	36.9 (34.9, 39.5)	0.06	40.2 (36.1, 46.9)	37.1 (35.3, 39.3)	<0.001
Outcome						
LOS (day), median (IQR)	2.20 (1.69, 3.40)	2.70 (1.78, 4.00)	<0.001	2.91 (2.07, 3.91)	3.92 (2.83, 6.04)	<0.001
LOS > 3 days, n (%)	1210 (30.06)	133 (38.78)	0.001	1835 (43.01)	1027 (64.11)	<0.001
LOS > 7 days, n (%)	201 (4.99)	25 (7.29)	0.066	228 (5.34)	285 (17.79)	<0.001
Re-admission in 30 days, n (%)	138 (3.43)	11 (3.21)	0.828	149 (3.49)	57 (3.56)	0.904

Re-emergency in 30 days, n (%)	304 (7.55)	23 (6.71)	0.567	279 (6.54)	112 (6.99)	0.537
--------------------------------	------------	-----------	-------	------------	------------	-------

* *P* values were calculated using the Kruskal–Wallis test for continuous variables and the chi-squared test for categorical variables.

† After the exclusion of patients who were <18 years old, had an LOS of <24 h, or had an LOS of >30 days, 343 of 634 patients who underwent appendectomy and had no preoperative glucose level measurements remained, and 1602 of 1629 patients who underwent laparoscopic cholecystectomy and had preoperative glucose level measurements remained.

‡ The 75th percentile of operation duration was 70 min for appendectomy and 111 min for cholecystectomy.

Abbreviations: ASA: American Society of Anesthesiologists, EBL: estimated blood loss, IQR: interquartile range, LOS: length of stay.

Table S2. Covariates assessed in the current study.

Covariates	Definitions
Biochemical variables	White blood cell (WBC) count, the proportion of neutrophils and lymphocytes, and neutrophil-to-lymphocyte ratio (NLR) as well as serum creatinine, hemoglobin, and liver function profiles within 48 h of the incision time for the procedures.
Procedure-related variables	Type of surgery (emergent vs. elective), American Society of Anesthesiologists score (ASA score), surgical wound contamination classification (clean, clean-contaminated, contaminated, and dirty-infected), operation duration, intraoperative blood loss, and body temperature at the time of operation.
History of hypertension	Being assigned an International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code of 401–405 and taking relevant medications at least once within 1 year prior to the procedure.
History of cardiovascular diseases	Being assigned an ICD-9-CM diagnosis code of 250.7, 410–414, 425–428, 430–438, 441–442, 458, 429.1–429.3, 441, 443.9, 785.4, or V43.4 within 1 year prior to the procedure.

Table S3. Missing rate of data on demographic and clinical characteristics of patients undergoing appendectomy or laparoscopic cholecystectomy.

Variable	Appendectomy (n= 4025)			Laparoscopic cholecystectomy (n= 4266)		
	Glucose <106 (n= 1320)	106 ≤ Glucose < 123 (n= 1291)	Glucose ≥ 123 (n= 1414)	Glucose < 102 (n= 1360)	102 ≤ Glucose < 128 (n= 1425)	Glucose ≥ 128 (n= 1481)
ASA Score	195 (14.77%)	218 (16.89%)	208 (14.71%)	166 (12.21%)	143 (10.04%)	147 (9.93%)
EBL (c.c.)	251 (19.02%)	287 (22.23%)	280 (19.80%)	205 (15.07%)	196 (13.75%)	208 (14.04%)
Wound class	225 (17.05%)	252 (19.52%)	236 (16.69%)	184 (13.53%)	168 (11.79%)	169 (11.41%)
Emergent	188 (14.24%)	210 (16.27%)	199 (14.07%)	188 (14.24%)	210 (16.27%)	199 (14.07%)
WBC (x 10 ³ /μL)	2 (0.15%)	0 (0.00%)	0 (0.00%)	21 (1.57%)	39 (2.74%)	118 (7.97%)
Neutrophil segment (%)	11 (0.83%)	7 (0.54%)	5 (0.35%)	530 (38.97%)	380 (26.67%)	282 (19.04%)
Lymphocyte (%)	11 (0.83%)	7 (0.54%)	5 (0.35%)	530 (38.97%)	380 (26.67%)	282 (19.04%)
NLR	11 (0.83%)	7 (0.54%)	5 (0.35%)	530 (38.97%)	380 (26.67%)	282 (19.04%)
CRP (mg/dL)	60 (4.55%)	35 (2.71%)	41 (2.90%)	1135 (83.46%)	832 (58.39%)	665 (44.90%)
Temperature (°C)	45 (3.41%)	46 (3.56%)	43 (3.04%)	640 (47.06%)	447 (31.37%)	322 (21.74%)
Pulse, median (IQR)	44 (3.33%)	45 (3.49%)	44 (3.11%)	637 (46.84%)	445 (31.23%)	322 (21.74%)
Post-operative glucose within 24 hours (mg/dL)	1225 (92.8%)	1206 (93.4%)	1139 (80.6%)	1253 (92.1%)	1206 (84.6%)	823 (55.6%)

Abbreviations: ASA: American Society of Anesthesiologists, CRP: C-reactive protein, EBL: estimated blood loss, NLR: neutrophil-to-lymphocyte ratio, WBC: white blood cell.

Table S4. Baseline demographic and clinical characteristics of patients undergoing appendectomy or laparoscopic cholecystectomy.

	Appendectomy (n= 4025)	Laparoscopic cholecystectomy (n= 4266)
Age (years), median (IQR)	38.0 (27.8, 51.8)	53.4 (41.1, 65.5)
Age group, n (%)		
≤30 years	1249 (31.03)	239 (5.84)
31-40 years	965 (23.98)	734 (17.21)
41-50 years	693 (17.22)	871 (20.42)
51-60 years	533 (13.24)	878 (20.58)
61-70 years	290 (7.20)	767 (17.98)
71-80 years	202 (5.02)	562 (13.17)
>80 years	93 (2.31)	205 (4.81)
Female, n (%)	1956 (48.60)	2268 (53.16)
Medical type - Admission, n (%)	4014 (99.73)	4264 (99.95)
Diabetes mellitus, n (%)		
Diagnosed diabetes mellitus	240 (5.96)	889 (20.84)
Undiagnosed diabetes mellitus	164 (4.07)	624 (14.63)
Hyperglycemia	969 (24.07)	686 (16.08)
Hypertension, n (%)	129 (3.20)	497 (11.65)
Cardiovascular disease, n (%)	212 (5.27)	461 (10.81)
ASA score, median (IQR)	1.00 (1.00, 2.00)	2.00 (2.00, 2.00)
ASA score ≥ 3, n (%)	290 (8.52)	657 (17.24)
Operation duration (minute), median (IQR)	55.0 (40.0, 70.0)	85.0 (65.0, 111.0)
>75 th percentile, n (%)*	985 (24.47)	1062 (24.89)
EBL (c.c.), median (IQR)	20.0 (20.0, 20.0)	20.0 (20.0, 20.0)
Wound class, n (%)		
Clean	129 (3.89)	550 (14.69)
Clean Contaminated	2331 (70.38)	2691 (71.86)
Contaminated	700 (21.14)	495 (13.22)
Dirty	150 (4.53)	8 (0.21)
Emergent, n (%)	3136 (91.48)	1118 (29.23)

Drain, n (%)	904 (22.46)	1893 (44.37)
Glucose (mg/dL), median (IQR)	113 (102, 130)	114 (97, 139)
WBC ($\times 10^3/\mu\text{L}$), median (IQR)	13.5 (10.8, 16.2)	7.8 (6.1, 10.8)
Neutrophil segment (%), median (IQR)	82.1 (75.4, 87.1)	67.2 (57.8, 80.0)
Lymphocyte (%), median (IQR)	11.7 (7.5, 17.2)	23.8 (12.8, 32.0)
NLR, median (IQR)	7.4 (4.6, 12.2)	2.9 (1.8, 6.9)
CRP (mg/dL), median (IQR)	2.2 (0.5, 6.9)	2.6 (0.4, 12.5)
Temperature ($^{\circ}\text{C}$), median (IQR)	37.1 (36.6, 37.8)	36.9 (36.5, 37.4)
Temperature $\geq 38^{\circ}\text{C}$, n (%)	786 (20.21)	401 (14.04)
Pulse, median (IQR), n (%)	91.0 (81.0, 104.0)	85.0 (75.0, 97.0)
Outcome		
LOS (day), median (IQR)	2.20 (1.69, 3.40)	2.91 (2.07, 3.91)
LOS > 3 days, n (%)	1210 (30.06)	1835 (43.01)
LOS > 7 days, n (%)	201 (4.99)	228 (5.34)
Re-admission in 30 days, n (%)	138 (3.43)	149 (3.49)
Re-emergency in 30 days, n (%)	304 (7.55)	279 (6.54)

* The 75th percentile of operation duration was 70 min for appendectomy and 111 min for cholecystectomy.

Abbreviations: ASA: American Society of Anesthesiologists, CRP: C-reactive protein, EBL: estimated blood loss, IQR: interquartile range, LOS: length of stay, NLR: neutrophil-to-lymphocyte ratio, WBC: white blood cell.

Table S5. Baseline demographic and clinical characteristics of patients undergoing emergent appendectomy or elective laparoscopic cholecystectomy.

	Emergency appendectomy surgery (n= 3136)				Elective laparoscopic cholecystectomy surgery (n= 2707)			
	Glucose <106 (n= 1015)	106 ≤ Glucose < 123 (n= 990)	Glucose ≥ 123 (n= 1131)	P-value*	Glucose < 102 (n= 1038)	102 ≤ Glucose < 128 (n= 899)	Glucose ≥ 128 (n= 770)	P-value*
Age (years), median (IQR)	30.9 (24.7, 40.5)	36.5 (27.2, 48.0)	48.6 (35.9, 60.7)	<0.001	45.1 (35.8, 57.5)	53.6 (42.1, 64.5)	62.8 (52.8, 71.3)	<0.001
Age ≥ 65, n (%)	47 (4.63)	68 (6.87)	203 (17.95)	<0.001	149 (14.35)	219 (24.36)	319 (41.43)	<0.001
Female, n (%)	563 (55.47)	462 (46.67)	496 (43.85)	<0.001	637 (61.37)	512 (56.95)	397 (51.56)	<0.001
Diabetes mellitus, n (%)				<0.001				<0.001
Diagnosed diabetes mellitus	17 (1.67)	16 (1.62)	170 (15.03)		75 (7.23)	132 (14.68)	363 (47.14)	
Undiagnosed diabetes mellitus	12 (1.18)	45 (4.55)	66 (5.84)		118 (11.37)	154 (17.13)	128 (16.62)	
Hyperglycemia	0 (0.00)	0 (0.00)	761 (67.29)		0 (0.00)	21 (2.34)	279 (36.23)	
Hypertension, n (%)	18 (1.77)	13 (1.31)	65 (5.75)	<0.001	77 (7.42)	93 (10.34)	183 (23.77)	<0.001
Cardiovascular disease, n (%)	32 (3.15)	32 (3.23)	109 (9.64)	<0.001	76 (7.32)	79 (8.79)	140 (18.18)	<0.001
ASA score, median (IQR)	1.00 (1.00, 2.00)	1.00 (1.00, 2.00)	2.00 (1.00, 2.00)	<0.001	2.00 (1.00, 2.00)	2.00 (1.00, 2.00)	2.00 (2.00, 3.00)	<0.001
ASA score ≥ 3, n (%)	57 (5.64)	63 (6.42)	149 (13.28)	<0.001	106 (10.25)	118 (13.20)	225 (29.37)	<0.001
Operation duration (minute), median (IQR)	50.0 (37.0, 64.0)	51.0 (40.0, 68.0)	56.0 (44.0, 75.0)	<0.001	78.0 (60.0, 102.0)	80.0 (62.0, 106.0)	88.0 (67.0, 113.0)	<0.001
>75 th percentile, n (%)†	174 (17.14)	200 (20.20)	302 (26.70)	<0.001	180 (17.34)	191 (21.25)	196 (25.45)	<0.001
EBL (c.c.), median (IQR)	20.0 (20.0, 20.0)	20.0 (20.0, 20.0)	20.0 (20.0, 20.0)	0.283	20.0 (20.0, 20.0)	20.0 (20.0, 20.0)	20.0 (20.0, 20.0)	<0.001
Wound class, n (%)				<0.001				<0.001
Clean	43 (4.37)	31 (3.25)	28 (2.55)		242 (23.75)	180 (20.48)	94 (12.43)	
Clean Contaminated	741 (75.30)	703 (73.77)	697 (63.54)		727 (71.34)	615 (69.97)	557 (73.68)	
Contaminated	176 (17.89)	190 (19.94)	293 (26.71)		48 (4.71)	83 (9.44)	104 (13.76)	
Dirty	24 (2.44)	27 (2.83)	79 (7.20)		2 (0.20)	1 (0.11)	1 (0.13)	
Drain, n (%)	171 (16.85)	214 (21.62)	370 (32.71)	<0.001	268 (25.82)	316 (35.15)	359 (46.62)	<0.001
Glucose (mg/dL), median (IQR)	98 (93, 102)	113 (109, 117)	139 (129, 159)	<0.001	91 (85, 97)	112 (106, 119)	150 (137, 179)	<0.001
WBC (x 10 ³ /μL), median (IQR)	12.4 (9.9, 14.9)	13.9 (11.4, 16.4)	14.3 (11.2, 17.2)	<0.001	6.7 (5.6, 8.1)	7.1 (5.8, 8.7)	7.5 (6.1, 10.4)	<0.001
Neutrophil segment (%), median (IQR)	77.7 (71.3, 83.7)	82.3 (76.8, 87.1)	85.2 (80.0, 89.0)	<0.001	59.0 (52.9, 65.6)	62.4 (55.1, 69.8)	65.5 (57.3, 77.4)	<0.001
Lymphocyte (%), median (IQR)	14.8 (10.1, 20.4)	11.1 (7.2, 15.7)	9.2 (6.3, 13.5)	<0.001	31.2 (25.3, 36.6)	27.9 (21.2, 34.1)	24.0 (13.9, 31.6)	<0.001
NLR, median (IQR)	5.4 (3.6, 8.5)	7.6 (5.0, 12.4)	9.8 (6.4, 14.8)	<0.001	1.9 (1.4, 2.6)	2.2 (1.6, 3.3)	2.8 (1.8, 5.9)	<0.001
CRP (mg/dL), median (IQR)	1.9 (0.4, 5.6)	1.9 (0.4, 5.6)	3.1 (0.6, 10.5)	<0.001	0.7 (0.3, 2.2)	1.1 (0.2, 7.0)	3.3 (0.4, 14.2)	<0.001
Temperature (°C), median (IQR)	37.0 (36.6, 37.5)	37.2 (36.6, 37.8)	37.4 (36.8, 38.2)	<0.001	36.7 (36.4, 37.0)	36.8 (36.5, 37.1)	36.9 (36.6, 37.3)	<0.001

Temperature $\geq 38^{\circ}\text{C}$, n (%)	117 (11.71)	198 (20.67)	360 (32.49)	<0.001	10 (1.82)	34 (6.30)	69 (12.73)	<0.001
Pulse, median (IQR) , n (%)	89.0 (79.0, 100.0)	92.0 (81.0, 105.0)	96.0 (84.0, 109.0)	<0.001	79.0 (71.0, 86.0)	81.0 (72.0, 92.0)	88.0 (77.0, 98.0)	<0.001
Outcome								
LOS (day), median (IQR)	1.99 (1.60, 2.82)	2.07 (1.62, 2.96)	2.40 (1.74, 3.97)	<0.001	2.82 (1.99, 3.04)	2.84 (2.01, 3.66)	3.03 (2.24, 4.48)	<0.001
LOS > 3 days, n (%)	208 (20.49)	234 (23.64)	434 (38.37)	<0.001	286 (27.55)	327 (36.37)	398 (51.69)	<0.001
LOS > 7 days, n (%)	19 (1.87)	31 (3.13)	71 (6.28)	<0.001	12 (1.16)	29 (3.23)	83 (10.78)	<0.001
Re-admission in 30 days, n (%)	25 (2.46)	33 (3.33)	46 (4.07)	0.117	19 (1.83)	28 (3.11)	33 (4.29)	0.009
Re-emergency in 30 days, n (%)	87 (8.57)	83 (8.38)	81 (7.16)	0.422	46 (4.43)	51 (5.67)	46 (5.97)	0.285

* *P* values were calculated using the Kruskal–Wallis test for continuous variables and chi-squared test for categorical variables.

† The 75th percentile of operation duration was 70 min for appendectomy and 111 min for cholecystectomy.

Abbreviations: ASA: American Society of Anesthesiologists, CRP: C-reactive protein, DM: diabetes mellitus, EBL: estimated blood loss, IQR: interquartile range, LOS: length of stay, NLR: neutrophil-to-lymphocyte ratio, WBC: white blood cell.

Table S6. Odds ratio (OR) for a hospital length-of-stay (LOS) of >3 days according to preoperative blood glucose level modeled on a continuous scale, in tertile groups, and with a clinical cutoff.

	N	Event	Crude OR (95% CI)	Model 1* Adjusted OR (95% CI)	Model 2† Adjusted OR (95% CI)	Model 3‡ Adjusted OR (95% CI)	Model 4§ Adjusted OR (95% CI)
Appendectomy							
				N = 4025	N = 4025	N = 4002	N = 3267
Glucose (per 10 mg/dL)	4025	1210	1.10 (1.08, 1.13)	1.06 (1.03, 1.08)	1.06 (1.03, 1.08)	1.05 (1.02, 1.07)	1.03 (1.00, 1.06)
<i>C-statistic</i>			0.616	0.649	0.650	0.662	0.814
Glucose, mg/dL (tertiles)							
Glucose <106	1320	296	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
106 ≤ Glucose <123	1291	334	1.21 (1.01, 1.45)	1.07 (0.89, 1.28)	1.08 (0.90, 1.30)	1.02 (0.85, 1.24)	0.95 (0.74, 1.21)
Glucose ≥ 123	1414	580	2.41 (2.04, 2.84)	1.68 (1.40, 2.01)	1.66 (1.38, 1.99)	1.49 (1.23, 1.81)	1.30 (1.01, 1.67)
<i>C-statistic</i>			0.600	0.653	0.654	0.663	0.814
Glucose, mg/dL (clinical)							
Glucose <100	784	165	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
100 ≤ Glucose <126	2013	519	1.30 (1.07, 1.59)	1.16 (0.95, 1.42)	1.17 (0.96, 1.44)	1.13 (0.91, 1.39)	1.08 (0.83, 1.42)
Glucose ≥ 126	1228	526	2.81 (2.29, 3.45)	1.89 (1.52, 2.36)	1.88 (1.50, 2.34)	1.70 (1.35, 2.14)	1.52 (1.12, 2.05)
<i>C-statistic</i>			0.604	0.655	0.656	0.665	0.815
Laparoscopic cholecystectomy							
				N = 4266	N = 4266	N = 3073	N = 2776
Glucose (per 10 mg/dL)	4266	1835	1.10 (1.08, 1.12)	1.07 (1.05, 1.09)	1.06 (1.04, 1.08)	1.06 (1.04, 1.08)	1.03 (1.01, 1.06)
<i>C-statistic</i>			0.616	0.649	0.652	0.677	0.771
Glucose, mg/dL (tertiles)							
Glucose <102	1360	437	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
102 ≤ Glucose <128	1425	575	1.43 (1.22, 1.67)	1.25 (1.07, 1.47)	1.26 (1.07, 1.48)	1.44 (1.18, 1.77)	1.17 (0.92, 1.48)
Glucose ≥ 128	1481	823	2.64 (2.27, 3.08)	1.94 (1.65, 2.29)	1.77 (1.50, 2.10)	1.76 (1.42, 2.19)	1.36 (1.06, 1.75)
<i>C-statistic</i>			0.607	0.649	0.654	0.677	0.771
Glucose, mg/dL (clinical)							
Glucose <100	1200	390	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
100 ≤ Glucose <126	1505	588	1.33 (1.14, 1.56)	1.16 (0.99, 1.37)	1.17 (0.99, 1.37)	1.29 (1.04, 1.60)	1.04 (0.82, 1.33)
Glucose ≥ 126	1561	857	2.53 (2.16, 2.96)	1.84 (1.56, 2.18)	1.68 (1.42, 2.00)	1.64 (1.31, 2.06)	1.24 (0.95, 1.60)
<i>C-statistic</i>			0.602	0.647	0.652	0.675	0.770

* Model 1: Adjusted for age and gender.

† Model 2: Adjusted for age at entry, gender, diabetes and hypertension.

‡ Model 3: Adjusted for age at entry, gender, diabetes, hypertension, WBC and NLR.

§ Model 4: Adjusted for age at entry, gender, diabetes, hypertension, cardiovascular disease, WBC, NLR, ASA score, wound classification, surgical drain, and operation duration above the 75th percentile.

|| ORs and corresponding 95% CIs were presented in **bold** when the 95% CI did not cross 1.

Abbreviations: ASA: American Society of Anesthesiologists, CI: confidence interval, NLR: neutrophil-to-lymphocyte ratio; OR: odds ratios, WBC: white blood cell.

Table S7. Relative risk (RR) for a hospital length-of-stay (LOS) of >3 days according to preoperative blood glucose level on a continuous scale, in tertile groups, and with a clinical cutoff using Model 4 (full model).*

	Logistic regression	Corrected RR	Robust quasi- Poisson regression
	OR (95% CI)	RR (95% CI)	RR (95% CI)
Appendectomy			
Glucose (per 10 mg/dL)	1.04 (1.01, 1.07)	-	1.01 (1.00, 1.02)
Glucose, mg/dL (tertiles)			
Glucose<106	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
106≤ Glucose <123	0.98 (0.79, 1.21)	0.98 (0.83, 1.16)	1.02 (0.91, 1.16)
Glucose ≥ 123	1.35 (1.09, 1.68)	1.25 (1.07, 1.46)	1.19 (1.06, 1.33)
Glucose, mg/dL (clinical)			
Glucose <100	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
100≤ Glucose <126	1.05 (0.83, 1.32)	1.04 (0.86, 1.24)	1.07 (0.93, 1.23)
Glucose ≥ 126	1.51 (1.16, 1.96)	1.36 (1.12, 1.63)	1.27 (1.10, 1.46)
Laparoscopic cholecystectomy			
Glucose (per 10 mg/dL)	1.02 (1.00, 1.04)	-	1.01 (1.00, 1.01)
Glucose, mg/dL (tertiles)			
Glucose <102	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
102≤ Glucose <128	1.07 (0.90, 1.29)	1.05 (0.93, 1.18)	1.06 (0.97, 1.16)
Glucose ≥ 128	1.37 (1.12, 1.67)	1.22 (1.08, 1.37)	1.17 (1.07, 1.29)
Glucose, mg/dL (clinical)			
Glucose <100	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
100≤ Glucose <126	1.00 (0.83, 1.20)	1.00 (0.88, 1.13)	1.02 (0.92, 1.12)
Glucose ≥ 126	1.26 (1.03, 1.55)	1.16 (1.02, 1.31)	1.13 (1.03, 1.25)

*Adjusted for age at entry, gender, diabetes, hypertension, cardiovascular disease, white blood cell count, neutrophil-to-lymphocyte ratio, American Society of Anesthesiologists score, wound classification, surgical drain, and operative duration (N = 3267).

Abbreviations: CI: confidence interval, LOS: length of stay, OR: odds ratio, RR: relative risk.

Figure S1. Flow diagram for the study population selection process.*.

*We excluded procedures if 1) there were incomplete data on gender, age, admission status, or operation status (n = 2392); (2) the operations had been performed before 2005 or after 2016 (n = 580); or (3) both an appendectomy and cholecystectomy were performed during the same admission (n = 1681). Among the remaining 5,527 appendectomies and 5,973 cholecystectomies, we further excluded procedures that (1) were subsequent procedures; (2) were not the only procedures on the same day; (3) were performed on patients younger than 18 years; (4) were discharged within 24 h of the procedure; (5) were hospitalized for more than 30 days of the procedure, and 6) did not have their blood glucose measured within 48 h before or on the date of the procedure.

Abbreviations: CMUH-CRDR, China Medical University Hospital Clinical Research Data Repository; LOS, length of hospital stay.

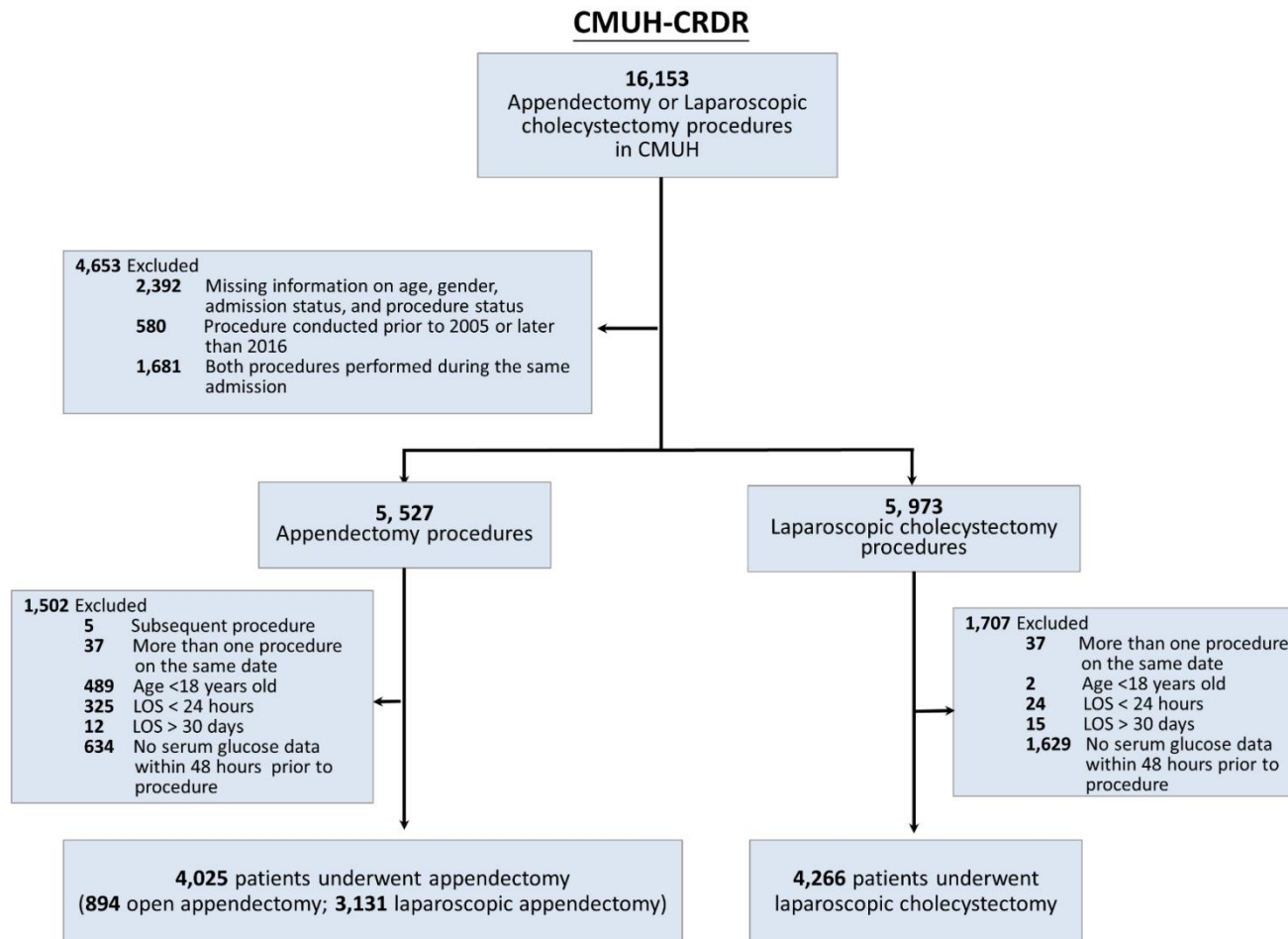


Figure S2. Correlation plots between preoperative glucose and postoperative glucose (n = 255 for appendectomy group and n = 929 for laparoscopic cholecystectomy group).

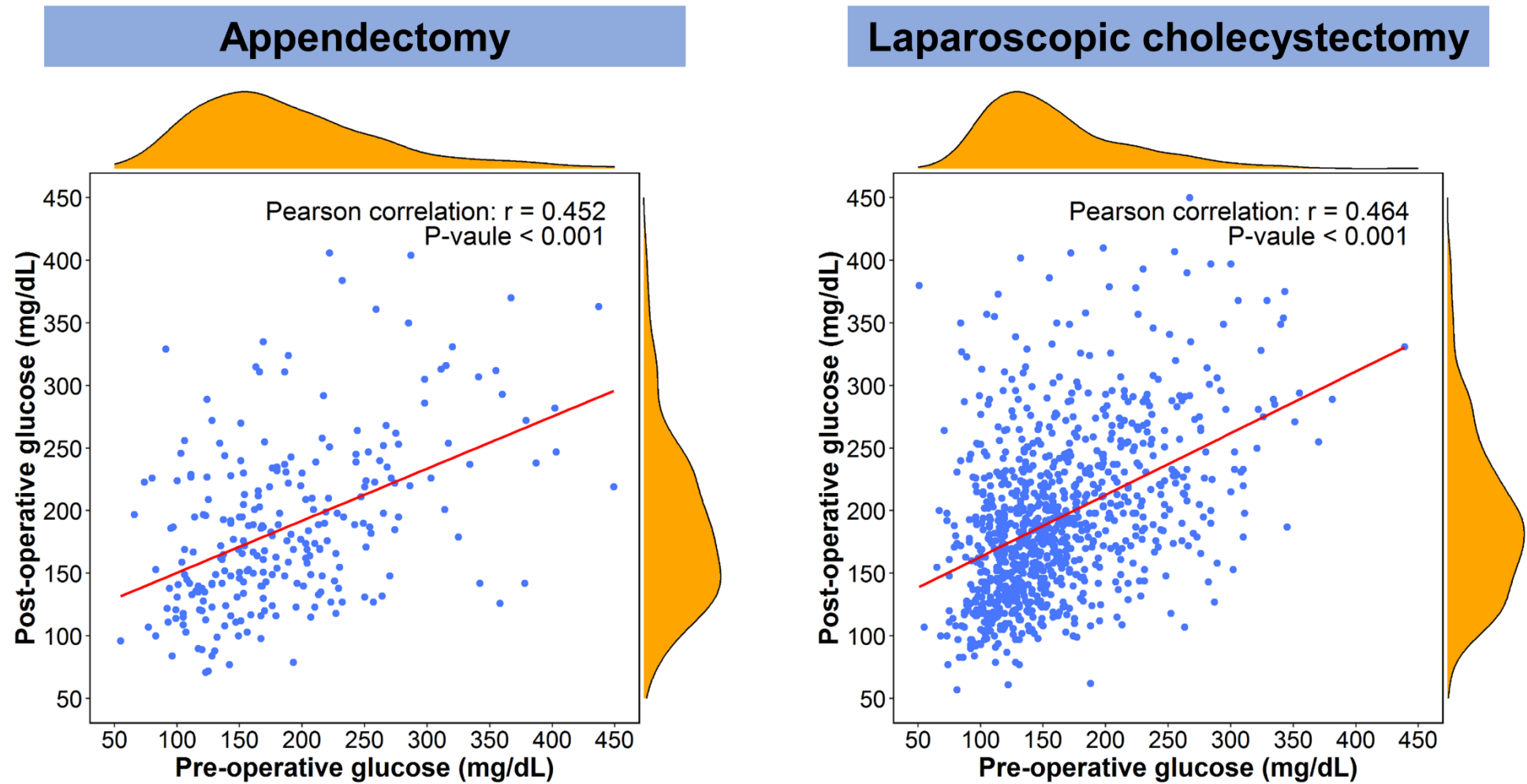
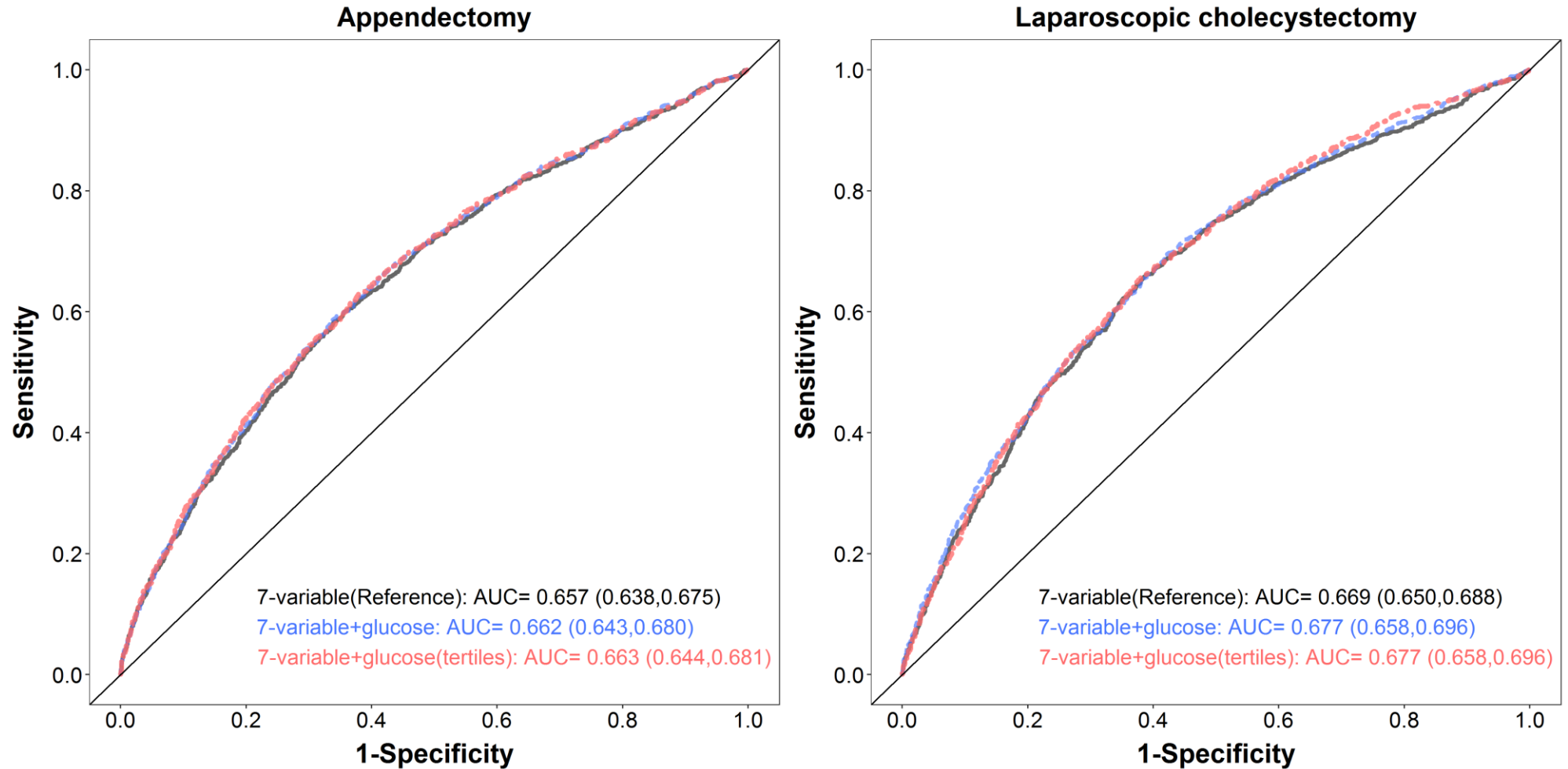


Figure S3. Discrimination and calibration performance of the seven-variable reference model and models with preoperative glucose in predicting a hospital length of stay of >3 days. The seven-variable reference model included age, sex, diabetes, hypertension, cardiovascular disease, white blood cell (WBC) count, and neutrophil-to-lymphocyte ratio (NLR).

(A) Receiver operating characteristic (ROC) curves for predicting a hospital length of stay of >3 days after incorporation of preoperative glucose level on a continuous scale or in tertile groups into the seven-variable reference model. For both appendectomy and cholecystectomy, *P* values for a comparison of the seven-variable reference model with the eight-variable model with preoperative glucose levels on a continuous scale or in tertile groups were all <0.05.



(B) Calibration plots for predicting a length of hospital stay of >3 days after incorporation of preoperative glucose level on a continuous scale or in tertile groups into the seven-variable reference model.

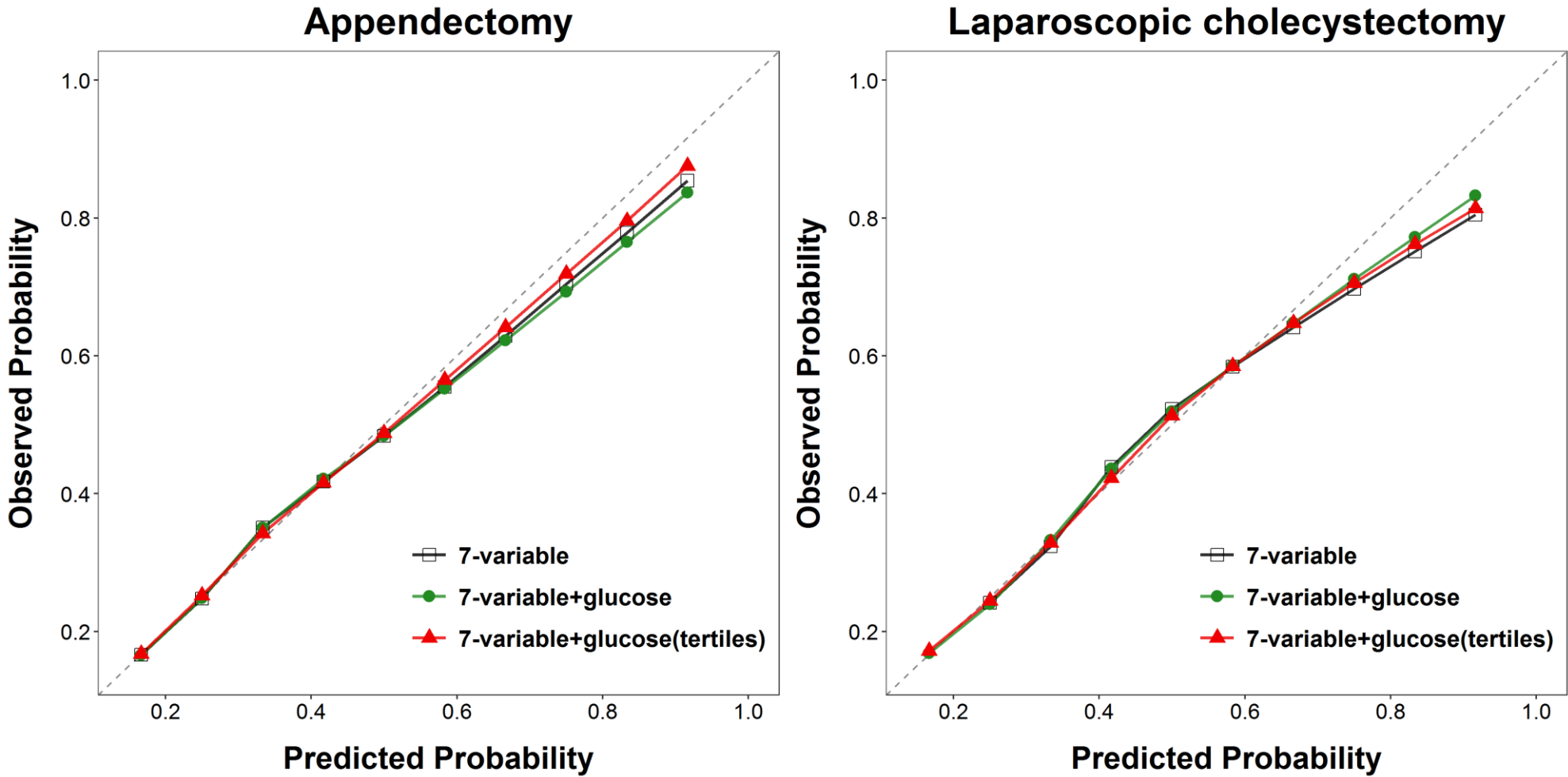


Figure S4. Correlation plots between preoperative glucose, white blood cell (WBC) count, neutrophil-to-lymphocyte ratio (NLR), and C-reactive protein (CRP).

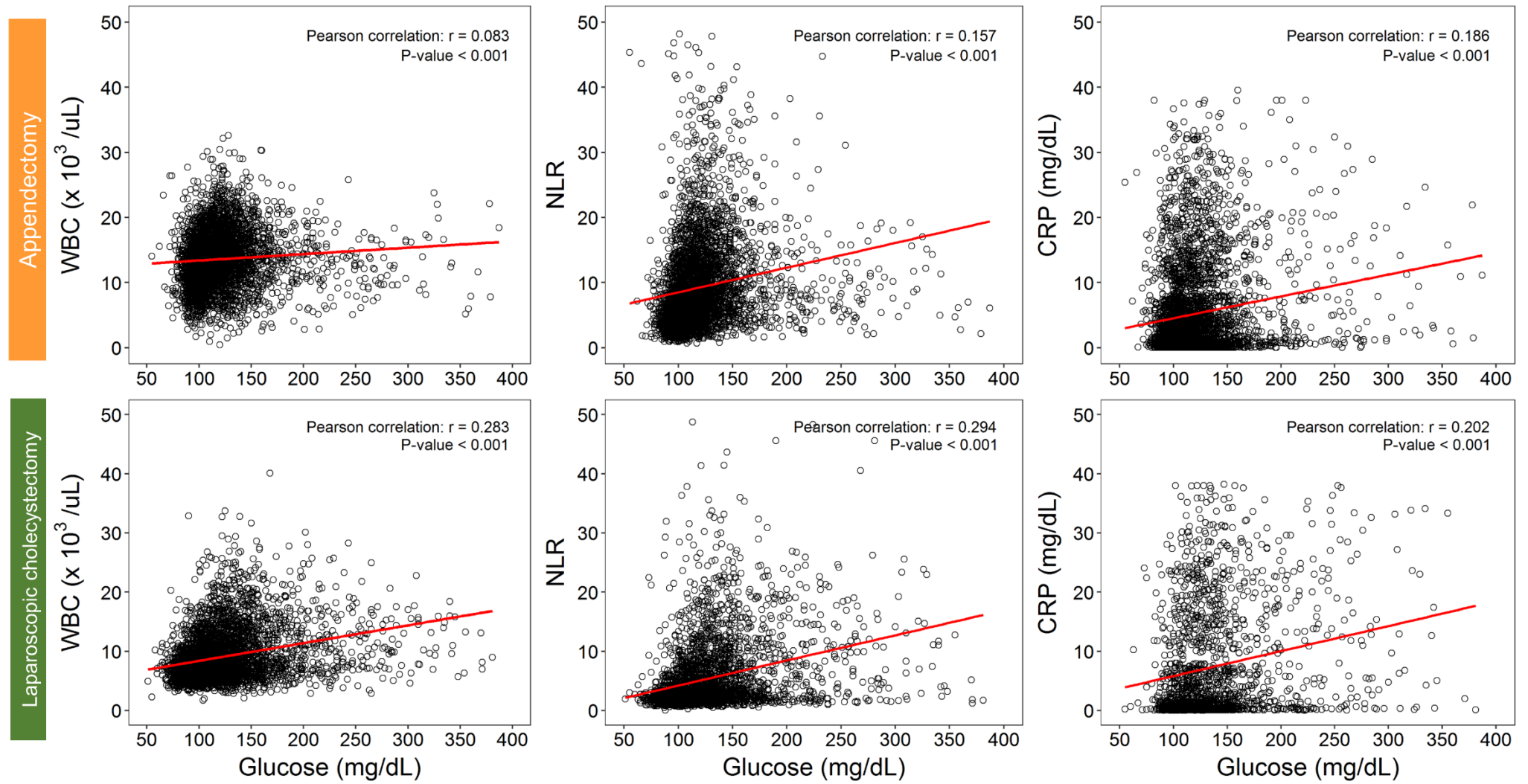
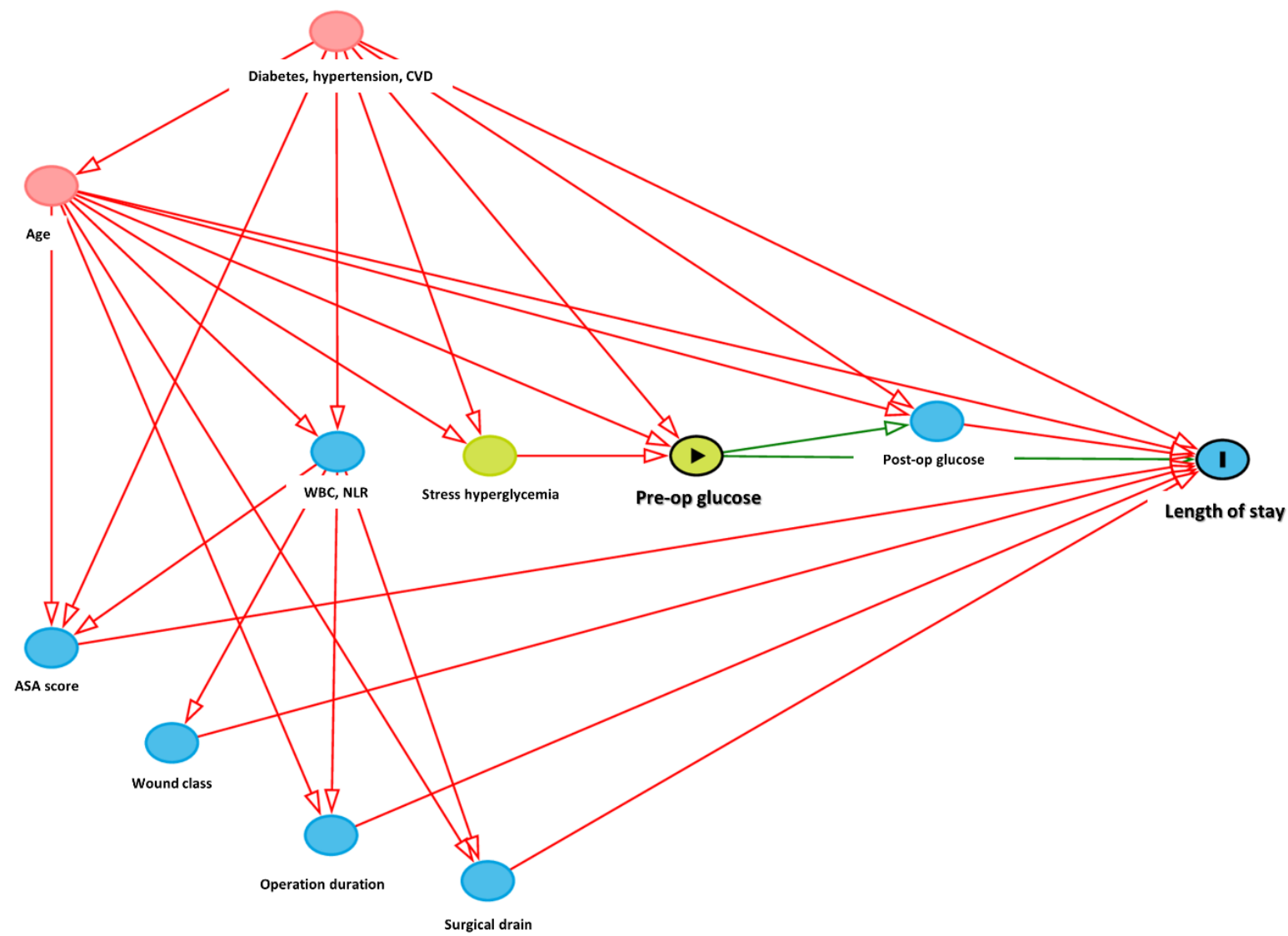


Figure S5. Directed acyclic graph (DAG) of the causal pathways between preoperative blood glucose and prolonged hospitalization among surgical patients.

(A) Unadjusted DAG



(B) DAG adjusted for age, diabetes, hypertension, cardiovascular disease, American Society of Anesthesiologists (ASA) score, wound class, operation duration, and surgical drain.

