Supplementary Material

Table S1. Multivariate linear regression models for LOS (log-transformed) on the derivation set.

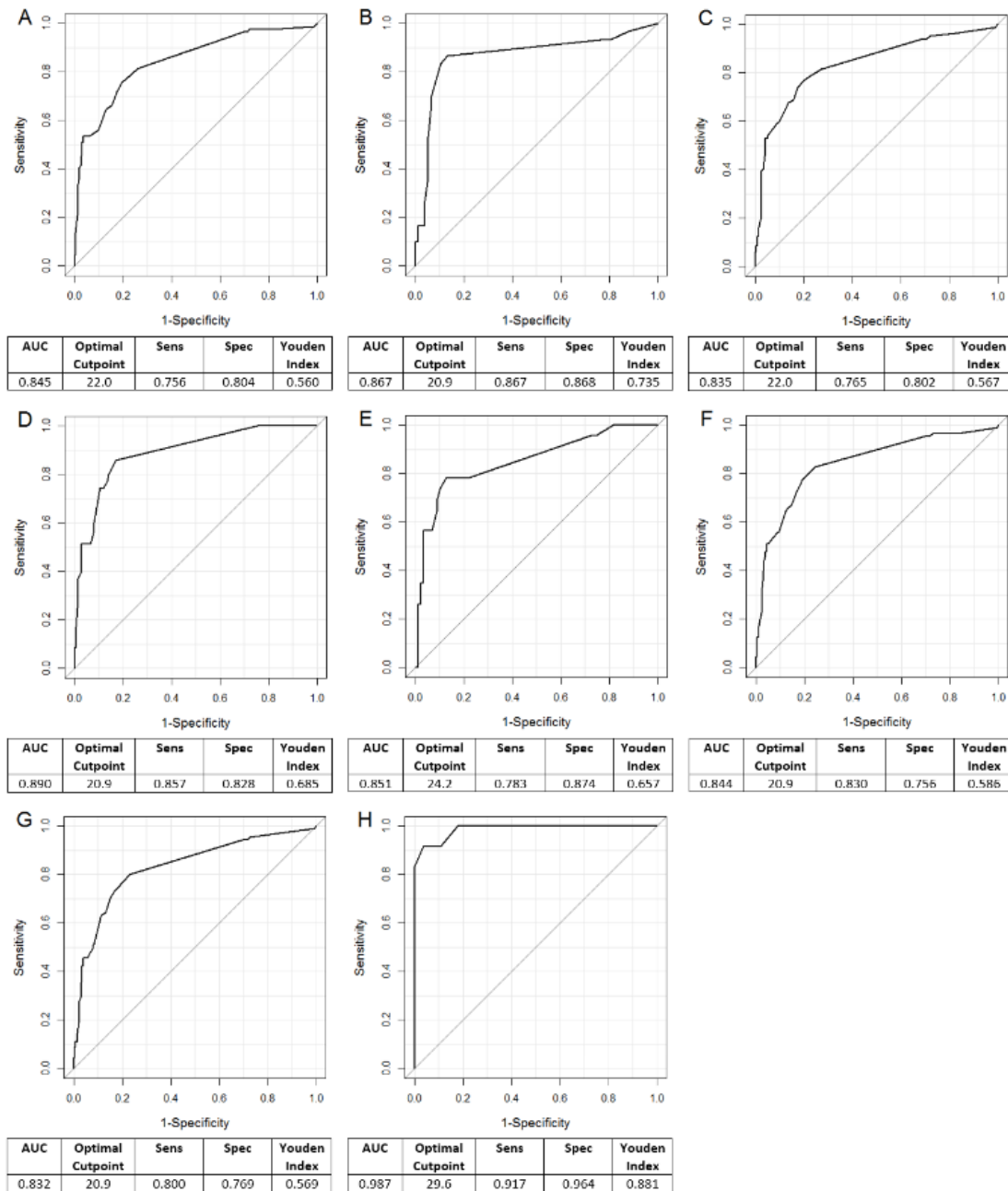| Sample	Variables	CCI model	Clavien-Dindo model
		Mean change (95% CI)	Mean change (95% CI)
Overall sample *n* = 1331	CCI, per 10 unit increase	0.267 (0.251;0.282)	-
	Clavien-Dindo, per category increase	-	0.291 (0.273;0.309)
	Surgery major vs minor	-0.012 (-0.065;0.041)	0.006 (-0.048;0.06)
	Laparoscopy vs open	-0.142 (-0.184;-0.1)	-0.134 (-0.177;-0.091)
	Age, per year	0.0001 (-0.002;0.003)	-0.0001 (-0.003;0.002)
	ASA score 3-4 vs 1-2	0.027 (-0.018;0.071)	0.037 (-0.008;0.083)
	Child grade B vs A	0.045 (-0.028;0.118)	0.054 (-0.022;0.129)
	Duration of surgery >4h vs ≤4h	0.103 (0.058;0.147)	0.108 (0.063;0.154)
	Center volume high vs med or low	-0.315 (-0.360;-0.270)	-0.353 (-0.399;-0.308)
Subgroup of patients with at least two complications *n* = 177	CCI, per 10 unit increase	0.219 (0.176;0.262)	-
	Clavien-Dindo, per category increase	-	0.223 (0.157;0.289)
	Surgery major vs minor	-0.056 (-0.235;0.124)	-0.009 (-0.212;0.193)
	Laparoscopy vs open	-0.168 (-0.319;-0.018)	-0.134 (-0.305;0.036)
	Age, per year	0.001 (-0.006;0.009)	0.001 (-0.008;0.010)
	ASA score 3-4 vs 1-2	0.141 (-0.006;0.289)	0.199 (0.034;0.364)
	Child grade B vs A	0.250 (-0.039;0.539)	0.336 (-0.002;0.674)
	Duration of surgery >4h vs ≤4h	0.261 (0.115;0.408)	0.280 (0.115;0.446)
	Center volume high vs med or low	-0.220 (-0.599;0.159)	-0.241 (-0.669;0.186)

LOS: Length of stay; CCI: Comprehensive Complication Index; CI: Confidence interval.

Table S2. Multivariate linear regression models for e-LOS (LOS ≥ 15 days) on the derivation set.

Sample	Variables	CCI model	Clavien-Dindo model
		OR (95% CI)	OR (95% CI)
Overall sample *n* = 1331	CCI, per 10 unit increase	5.507 (4.152;7.304)	-
	Clavien-Dindo, per category increase	-	5.590 (4.201;7.438)
	Surgery major vs minor	0.810 (0.400;1.641)	1.014 (0.521;1.973)
	Laparoscopy vs open	0.623 (0.344;1.128)	0.740 (0.413;1.324)
	Age, per year	0.990 (0.961;1.021)	0.991 (0.961;1.022)
	ASA score 3-4 vs 1-2	1.712 (0.914;3.208)	1.978 (1.068;3.662)
	Child grade B vs A	0.892 (0.336;2.372)	1.336 (0.506;3.528)
	Duration of surgery >4h vs ≤4h	1.669 (0.912;3.053)	1.769 (0.989;3.162)
	Center volume high vs med or low	0.650 (0.341;1.241)	0.267 (0.133;0.533)
Subgroup of patients with at least two complications *n* = 177	CCI, per 10 unit increase	2.793 (1.896;4.115)	-
	Clavien-Dindo, per category increase	-	2.439 (1.666;3.57)
	Surgery major vs minor	0.779 (0.269;2.256)	1.021 (0.394;2.645)
	Laparoscopy vs open	0.551 (0.227;1.339)	0.673 (0.294;1.544)
	Age, per year	0.976 (0.937;1.016)	0.98 (0.943;1.018)
	ASA score 3-4 vs 1-2	3.093 (1.217;7.861)	3.336 (1.422;7.822)
	Child grade B vs A	2.016 (0.45;9.036)	3.469 (0.822;14.634)
	Duration of surgery >4h vs ≤4h	3.417 (1.458;8.007)	3.179 (1.449;6.975)
	Center volume high vs med or low	0.316 (0.046;2.197)	0.312 (0.046;2.124)

LOS: Length of stay; CCI: Comprehensive Complication Index; OR: Odds Ratio; CI: Confidence interval.

Figure S1. ROC curves on subgroups of patients with at least one complication showing the performance of CCI to identify those with e-LOS. The subgroups considered are: (**A**) minor surgery, (**B**) major surgery, (**C**) open surgery, (**D**) laparoscopy surgery, (**E**) no cirrhosis, (**F**) cirrhosis, (**G**) Child-Pugh grade A, (**H**) Child-Pugh grade B. The AUC values and the optimal cut-point identified by the Youden Index with the corresponding sensitivity, specificity, positive and negative predictive values are also reported.