1 SUPPLEMENTAL MATERIAL

2 Misestimation of Coronary Lesions and Rectification by SYNTAX Score Feedback for

3 Coronary Revascularization Appropriateness

Contents	Page
I. Expanded Methods and Results	
1.1. Chinese Appropriate Use Criterion for Coronary Revascularization	
Supplemental Table 1.1.1. Recommendations for patients with acute coronary syndromes	1
Supplemental Table 1.1.2. Recommendations for patients without prior bypass surgery	2
Supplemental Table 1.1.3. Recommendations for patients with prior bypass surgery (without acute coronary syndrome)	8
Supplemental Table 1.1.4. Chinese AUC recommendations for patients with advanced coronary disease, CCS angina greater than or equal to class III, and/or evidence of high-risk findings on noninvasive testing	10
1.2. Image analysts training and testing	13
1.3. Clinical endpoint definitions	18
1.4. Supplementary materials for statistical analysis	20
Supplemental Table 1.4.1. Multivariable hierarchical logistic regression of inappropriate revascularization	22
Supplemental Table 1.4.2. Univariate analysis for one-year major adverse cardiac events	23
II. Additional Tables	
Supplementary Table 1. Cardiologist characteristics	24
Supplementary Table 2. One-year clinical outcome in the control and intervention groups.	26
Supplementary Table 3. One-year clinical outcomes in subgroups of different	27

treatment strategies	
III. Additional Figures	
Supplementary Figure 1. Decision-making procedures in the control group and the intervention group	28
Supplementary Figure 2. Subgroup analyses of inappropriate PCI and PCI utilization	29
Supplementary Figure 3. Rate of surgical consultation in 3-vessel or left main coronary diseases	31
Supplementary Figure 4. Rate of ad hoc PCI in 3-vessel or left main coronary diseases	32

5 **1.1. Chinese Appropriate Use Criterion for Coronary Revascularization**

6 Supplemental Table 1.1.1. Recommendations for patients with acute coronary

7 syndromes

	Indication	Appropriate Use Score (1-9)
	• STEMI	
1	• ≤12 hours from onset of symptoms	A (9)
	Revascularization of the culprit artery	
	• STEMI	
2	• ≤12 hours from onset of symptoms	I (3)
	• Revascularization of the non-culprit artery	
	• STEMI	
2	• 12 to 24 hours from onset of symptoms	A (9)
3	• Severe HF, persistent ischemic symptoms, or	A (8)
	hemodynamic or electrical instability present	
	• STEMI	
	• ≥12 hours from symptom onset	
4	Asymptomatic	I (3)
	• No hemodynamic instability and no electrical	
	instability	
	• STEMI with presumed successful treatment with	
	fibrinolysis	
5	• Evidence of HF, recurrent ischemia, or unstable	A (8)
	ventricular arrhythmias present	
	• One-vessel CAD presumed to be the culprit artery	
	• STEMI with presumed successful treatment with	
	fibrinolysis	
6	• Asymptomatic, no HF or no recurrent ischemic	$\mathbf{U}(\boldsymbol{\epsilon})$
0	symptoms, or no unstable ventricular arrhythmias	U (6)
	Normal LVEF	
	• One-vessel CAD presumed to be the culprit artery	
	• STEMI with presumed successful treatment with	
	fibrinolysis	
	• Asymptomatic, no HF, no recurrent ischemic	
7	symptoms, or no unstable ventricular arrhythmias at	Δ (9)
/	the time of presentation	A (8)
	Depressed LVEF	
	Three-vessel CAD	
	Elective/semi-elective revascularization	
8	• STEMI with successful treatment of the culprit artery	A (7)
0	by primary PCI or fibrinolysis	Δ(/)

-		
	• Asymptomatic; no HF, no evidence of recurrent or	
	provokable ischemia, or no unstable ventricular	
	arrhythmias during index hospitalization	
	Normal LVEF	
	• Revascularization A of a non-infarct-related artery	
	during index hospitalization	
	• STEMI or NSTEMI and successful PCI of culprit	
	artery during index hospitalization	
9	• Symptoms of recurrent myocardial ischemia and/or	A (O)
9	high-risk findings on noninvasive stress testing	A (8)
	performed after index hospitalization	
	• Revascularization of ≥1 additional coronary arteries	
	• UA/NSTEMI and high-risk features for short-term risk	
10	of death or nonfatal MI	A (9)
	• Revascularization of the presumed culprit artery	
	• UA/NSTEMI and high-risk features for short-term risk	
11	of death or nonfatal MI	A (D)
11	• Revascularization of multiple coronary arteries when	A (8)
	the culprit artery cannot clearly be determined	
	Patients with acute myocardial infarction (STEMI or	
10	NSTEMI)	
12	• Evidence of cardiogenic shock	A (8)
	• Revascularization of ≥ 1 coronary arteries	
	• UA/NSTEMI and low-risk features (e g, TIMI score	
13	≤2) for short-term risk of death or nonfatal MI	A (7)
	• Revascularization of the presumed culprit artery	
	• UA/NSTEMI and intermediate-risk features (e g, TIMI	
14	score 3-4) for short-term risk of death or nonfatal MI	A (7)
	• Revascularization of the presumed culprit artery	~ /
L	<u> </u>	

A: appropriate; U: uncertain; I: inappropriate; LVEF: left ventricular ejection fraction; UA:
unstable angina; NSTEMI: non-ST-segment elevation myocardial infarction; TIMI:
thrombolysis in myocardial infarction study; PCI: percutaneous coronary intervention.

Supplemental Table 1.1.2. Recommendations for patients without prior bypass surgery

rgery			1		
			Appropria	ate Use Sc	ore (1-9)
		Indication	CCS		
		mulcauon	Asympto matic	I or II	III or IV
	•	One- or 2-vessel CAD without			
15		involvement of proximal LAD			
	•	No noninvasive testing performed	I (1)	U (4)	U (6)
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
	•	One- or 2-vessel CAD without			
16		involvement of proximal LAD			
	•	No noninvasive testing performed	I (3)	U (5)	A (7)
	•	Receiving two or three courses of			
		anti-ischemic medical therapy			
	•	One- or 2-vessel CAD without			
		involvement of proximal LAD			
17	•	No ischemic findings on noninvasive	I (1)	I (3)	U (4)
1/		testing	* (1)	- (3)	
	•	Receiving no or one course of			
	_	anti-ischemic medical therapy			
	•	One- or 2-vessel CAD without			
18		involvement of proximal LAD			
	•	No ischemic findings on noninvasive	I (2)	I (3)	U (6)
		testing	- (-)	- (-)	- (-)
	•	Receiving two or three courses of			
	_	anti-ischemic medical therapy			
	•	One- or 2-vessel CAD without			
19		involvement of proximal LAD			
	•	Ischemic findings on noninvasive	I (3)	U (6)	A (7)
		testing			
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
20	•	One- or 2-vessel CAD without			
20		involvement of proximal LAD			
	•	Ischemic findings on noninvasive	U (5)	A (7)	A (8)
		testing Paceiving two or three courses of			
		Receiving two or three courses of			
	•	anti-ischemic medical therapy			
		CAD with borderline stenosis "50% – 70%"			
21	•		I (1)	I (3)	U (4)
21		22No ischemic findings on			
		noninvasive testing			

	• No further invasive evaluation			
	performed (ie, FFR, IVUS)			
	 Receiving no or one course of 			
	anti-ischemic medical therapy			
	CAD with borderline stenosis			
	"50%-70%"			
	No ischemic findings on noninvasive tooting			
22	testingNo further invasive evaluation	I (2)	I (3)	U (6)
	performed (ie, FFR, IVUS)			
	Receiving two or three courses of anti-ischemic modical thereasy			
	anti-ischemic medical therapy			
	• CAD with borderline stenosis			
	"50%-70%" Uncertain isohomia findinga an			
	Uncertain ischemic findings on noninvesive testing			
23	 noninvasive testing FFR≤0.8 and/or IVUS with 	I (2)	$\mathbf{II}(\boldsymbol{\epsilon})$	A (0)
23		I (3)	U (6)	A (8)
	significant reduction in cross-sectional			
	area			
	Receiving no or one course of			
	anti-ischemic medical therapy			
	• CAD with borderline stenosis			
	"50%-70%"			
	• Uncertain ischemic findings on			
24	noninvasive testing		A (7)	A (0)
24	• FFR ≤ 0.8 and/or IVUS with	U (6)	A (7)	A (9)
	significant reduction in cross-sectional			
	area			
	• Receiving two or three courses of			
	anti-ischemic medical therapy			
	• CAD with borderline stenosis			
	"50%-70%"			
	Uncertain ischemic findings on noninvesive testing			
25	noninvasive testing $EED > 0.8$ and (or WUS) findings do not	I (1)	I (3)	I (3)
	• FFR>0.8 and/or IVUS findings do not			
	meet criteria for significant stenosis			
	Receiving no or one course of			
	anti-ischemic medical therapy			
	• CAD with borderline stenosis			
	"50%-70%"			
26	• Uncertain ischemic findings on	I (1)	I (3)	U (4)
	noninvasive testing			. /
	• FFR>0.8 and/or IVUS findings do not			
	meet criteria for significant stenosis			

	•	Receiving two or three courses of			
		anti-ischemic medical therapy			
	•	CAD with borderline stenosis	1	1	
		"50%-70%"			
	•	No ischemic findings on noninvasive	T (2)		
27		testing	I (3)	U (4)	U (6)
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
	•	CAD with borderline stenosis			
		"50%-70%"			
20	•	No ischemic findings on noninvasive			A (7)
28		testing	U (5)	U (6)	A (7)
	•	Receiving two or three courses of			
		anti-ischemic medical therapy			
	•	Chronic total occlusion of 1 major			
		epicardial coronary artery, without			
29		other coronary stenosis	I (3)	U (4)	A (7)
29	•	No noninvasive testing performed	1(5)	0 (4)	A (7)
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
	•	Chronic total occlusion of 1 major			
		epicardial coronary artery, without			
30		other coronary stenosis	I (3)	U (6)	A (8)
50	•	No noninvasive testing performed	1(3)		11(0)
	•	Receiving two or three courses of			
	_	anti-ischemic medical therapy	<u> </u>	ļ	
	•	Chronic total occlusion of 1 major			
		epicardial coronary artery, without			
		other coronary stenosis			
31	•	No ischemic findings on noninvasive	I (2)	U (4)	U (6)
		testing			
	•	Receiving no or one course of			
	_	anti-ischemic medical therapy			
	•	Chronic total occlusion of 1 major			
		epicardial coronary artery, without			
~ -		other coronary stenosis			
32	•	No ischemic findings on noninvasive	I (3)	U (6)	A (7)
		testing			
	•	Receiving two or three courses of			
	_	anti-ischemic medical therapy			
	•	Chronic total occlusion of 1 major			
33		epicardial coronary artery, without	I (3)	A (7)	A (8)
		other coronary stenosis			, í
	•	Ischemic findings on noninvasive			

		testing			
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
	•	Chronic total occlusion of 1 major			
		epicardial coronary artery, without			
		other coronary stenosis			
34	•	Ischemic findings on noninvasive	U (6)	A (7)	A (8)
		testing	- (-)	(//	(-)
	•	Receiving two or three courses of			
		anti-ischemic medical therapy			
	•	One-vessel CAD involving the			
		proximal LAD			
35	•	No noninvasive testing performed	U (5)	U (6)	A (8)
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
	•	One-vessel CAD involving the			
		proximal LAD			
36	•	No noninvasive testing performed	U (5)	A (7)	A (8)
	•	Receiving two or three courses of			
		anti-ischemic medical therapy			
	•	One-vessel CAD involving the			
		proximal LAD			
37	•	No ischemic findings on noninvasive	I (3)	U (5)	A (7)
57		testing	1(5)	0(3)	$\Lambda(l)$
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
	•	One-vessel CAD involving the			
		proximal LAD			
38	•	No ischemic findings on noninvasive	U (4)	U (6)	A(8)
		testing		X-7	<-/
	•	Receiving two or three courses of			
		anti-ischemic medical therapy			
	•	One-vessel CAD involving the			
		proximal LAD			
39		Ischemic findings on noninvasive	U (5)	A (7)	A (8)
		testing			
		Receiving no or one course of			
		anti-ischemic medical therapy			
		One-vessel CAD involving the			
		proximal LAD Ischemic findings on poninyasiya			
40	Ĩ	Ischemic findings on noninvasive testing	A (7)	A (8)	A (9)
		Receiving two or three courses of			
	Ĩ	anti-ischemic medical therapy			
		and-ischenne medical dierapy			

		Two-vessel CAD involving the			
	-	proximal LAD			
41		•	U (4)	U (6)	A (9)
41		No noninvasive testing performed Receiving no or one course of	0 (4)	0(0)	A (8)
	-	anti-ischemic medical therapy			
		Two-vessel CAD involving the			
	-	proximal LAD			
42		No noninvasive testing performed	U (6)	A (7)	A (9)
42		Receiving two or three courses of	0(0)	A(I)	A(9)
	_	anti-ischemic medical therapy			
	•	Two-vessel CAD involving the			
	_	proximal LAD			
	•	No ischemic findings on noninvasive			
43		testing	U (4)	U (6)	A (7)
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
	•	Two-vessel CAD involving the			
		proximal LAD			
	•	No ischemic findings on noninvasive			
44		testing	U (4)	U (6)	A (8)
	•	Receiving two or three courses of			
		anti-ischemic medical therapy			
	•	Two-vessel CAD involving the			
		proximal LAD			
45	•	Ischemic findings on noninvasive		A (0)	
45		testing	A (7)	A (8)	A (9)
	•	Receiving no or one course of			
		anti-ischemic medical therapy			
	•	Two-vessel CAD involving the			
		proximal LAD			
46	•	Ischemic findings on noninvasive	A (7)	A (8)	Λ (0)
-10		testing	A(I)	A (0)	A (9)
	•	Receiving two or three courses of			
		anti-ischemic medical therapy			
	•	Three-vessel CAD (no left main)			
	•	No noninvasive testing performed and			
47		normal LV systolic function	U (5)	A (7)	A (8)
	•	Receiving no or one course of			
	\square	anti-ischemic medical therapy			
	•	Three-vessel CAD (no left main)			
10	•	No noninvasive testing performed and			
48		normal LV systolic function	U (6)	A (7)	A (8)
	•	Receiving two or three courses of			
		anti-ischemic medical therapy			

49	 Three-vessel CAD (no left main) No ischemic findings on noninvasive testing Receiving no or one course of anti-ischemic medical therapy 	U (5)	U (6)	A (7)
50	 Three-vessel CAD (no left main) No ischemic findings on noninvasive testing Receiving two or three courses of anti-ischemic medical therapy 	U (5)	A (7)	A (8)
51	 Three-vessel CAD (no left main) Ischemic findings on noninvasive testing Receiving no or one course of anti-ischemic medical therapy 	A (7)	A (8)	A (9)
52	 Three-vessel CAD (no left main) Ischemic findings on noninvasive testing Receiving two or three courses of anti-ischemic medical therapy 	A (7)	A (8)	A (9)
53	 Three-vessel CAD (no left main) Abnormal LV systolic function 	A (7)	A (8)	A (9)
54	Left main stenosis	A (7)	A (9)	A (9)

15 CAD: coronary artery diseases; LAD: left anterior descending; FFR: fractional flow reserve;

16 IVUS: intravenous ultrasound; LVEF: left ventricular ejection fraction.

17

Supplemental Table 1.1.3. Recommendations for patients with prior bypass surgery (without acute coronary syndrome)

	acute coronary syndrome)	T		
		Appropriate Use Score (1-9)		
	Indication	CCS		
	indication	Asympto	I or II	III or IV
		matic	10111	
	• One or more stenosis in saphenous			
	vein graft(s)			
	• No noninvasive testing performed	I (3)	U (5)	U (6)
55	• Receiving no or one course of			
	anti-ischemic medical therapy			
	• One or more stenosis in saphenous			
	vein graft(s)			
56	• No noninvasive testing performed	I (5)	U (6)	A (8)
	• Receiving two or three courses of			
	anti-ischemic medical therapy			
	• One or more stenosis in saphenous			
	vein graft(s)			
57	• No ischemic findings on noninvasive	I(2)	U (5)	$\mathbf{U}(6)$
57	testing	I (3)	U (5)	U (6)
	• Receiving no or one course of			
	anti-ischemic medical therapy			
	• One or more stenosis in saphenous			
	vein graft(s)			
58	• No ischemic findings on noninvasive	$\mathbf{II}(\mathbf{A})$	\mathbf{I}	A (7)
30	testing	U (4)	U (6)	A (7)
	• Receiving two or three courses of			
	anti-ischemic medical therapy			
	• One or more stenosis in saphenous			
	vein graft(s)			
59	• Ischemic findings on noninvasive	U (5)	U (6)	A (8)
39	testing	0(3)	0(0)	A (0)
	• Receiving no or one course of			
	anti-ischemic medical therapy			
	• One or more stenosis in saphenous			
	vein graft(s)			
60	• Ischemic findings on noninvasive	U (6)	A (8)	A (9)
00	testing	0 (0)	11(0)	11())
	• Receiving two or three courses of			
	anti-ischemic medical therapy			
	• All bypass grafts patent and without			
61	significant disease	I (3)	U (5)	U (6)
01	• One or more lesions in native	1(3)	0(3)	0 (0)
	coronary arteries without bypass			

		grafts			
	•	No noninvasive testing performed			
		Receiving no or one course of			
	-	anti-ischemic medical therapy			
	-	All bypass grafts patent and without			
	Ĩ	significant disease			
		One or more lesions in native			
	Ĩ				
62		coronary arteries without bypass	I (3)	U (6)	A (7)
		grafts			
		No noninvasive testing performed			
		Receiving two or three courses of			
	_	anti-ischemic medical therapy			
	•	All bypass grafts patent and without			
		significant disease			
		One or more lesions in native			
62		coronary arteries without bypass	I (2)	II (5)	$\mathbf{U}(\boldsymbol{\epsilon})$
63		grafts	I (3)	U (5)	U (6)
		No ischemic findings on noninvasive			
		testing Bessiving as an ana source of			
		Receiving no or one course of			
	_	anti-ischemic medical therapy			
		All bypass grafts patent and without			
		significant disease One or more lesions in native			
64		coronary arteries without bypass	I(2)	$\mathbf{U}(5)$	Λ (7)
04		grafts	I (3)	U (5)	A (7)
	Ĩ	No ischemic findings on noninvasive			
		testing Receiving two or three courses of			
	Ĩ	anti-ischemic medical therapy			
	_				
	ľ	All bypass grafts patent and without significant disease			
		One or more lesions in native			
		coronary arteries without bypass			
65		grafts	U (5)	U (6)	A (8)
05		Ischemic findings on noninvasive	0(3)	0(0)	A (0)
	ſ	testing			
	•	Receiving no or one course of			
	ſ	anti-ischemic medical therapy			
	•	All bypass grafts patent and without			
		significant disease			
66	•	One or more lesions in native	U (6)	A (7)	A (8)
00		coronary arteries without bypass		11(1)	11(0)
		grafts			
		grano			

•	Ischemic findings on noninvasive
	testing
•	Receiving two or three courses of
	anti-ischemic medical therapy

23 Supplemental Table 1.1.4. Chinese AUC recommendations for patients with advanced

coronary disease, CCS angina greater than or equal to class III, and/or evidence of

25 high-risk findings on noninvasive testing

	Indication	Appropriate U	se Score (1-9)
	Indication	PCI	CABG
	• Two-vessel CAD with proximal LAD		
67	stenosis	A (8)	A (8)
	No diabetes and normal LVEF		
	• Two-vessel CAD with proximal LAD		
68	stenosis	A (7)	A (9)
	• Diabetes		
	• Two-vessel CAD with proximal LAD		
69	stenosis	A (8)	A (9)
	Depressed LVEF		
	Three-vessel CAD		
	• SYNTAX≥33		
70	01111112 33	U (4)	A (9)
	• No diabetes		
	Normal LVEF		
	Three-vessel CAD		
71	• SYNTAX 23~32	U (6)	A (8)
/1	• No diabetes	0 (0)	11(0)
	Normal LVEF		
	Three-vessel CAD		
	• SYNTAX ≤22		
72		A (98)	A (7)
	• No diabetes		
	Normal LVEF		_
	Three-vessel CAD		
73	 SYNTAX ≥33 	I (3)	A (9)
15		1 (5)	
	• Diabetes		
	Three-vessel CAD		
74	• SYNTAX 23~32	U (4)	A (8)
	• Diabetes		_
	Three-vessel CAD		
75	• SYNTAX ≤ 22	A (7)	A (8)
	• Diabetes		
	Three-vessel CAD		
_			
76	• SYNTAX \geq 33	I (3)	A (9)
	Depressed LVEF		
77	Three-vessel CAD	U (5)	A (9)

• Depressed LVEFImage: CAD78• SYNTAX ≤ 22A (7)A (8)78• SYNTAX ≤ 22A (7)A (8)79• Isolated left main stenosisA (7)A (9)80• Isolated left main stenosisA (7)A (9)81• Isolated left main stenosisA (7)A (9)82• SYNTAX ≥ 33I (3)A (9)82• SYNTAX ≥ 33I (3)A (9)83• Left main stenosis and additional CADA (7)A (9)84• Left main stenosis and additional CADA (7)A (9)83• Left main stenosis and additional CADA (7)A (9)84• SYNTAX 23-32A (7)A (9)84• SYNTAX 22-32A (8)A (8)85• Normal LVEFA (8)A (8)86• SYNTAX ≤ 22A (8)A (8)87• Left main stenosis and additional CADA (9)88• SYNTAX ≥ 33I (3)A (9)9• DiabetesII (3)A (9)9• DiabetesII (3)A (9)9• SYNTAX ≥ 33I (3)A (9)9• DiabetesII (3)A (9)9• SYNTAX ≥ 33I (3)A (9)9• DiabetesII (3)<		• SYNTAX 23~32		
•Three-vessel CADA (7)A (8)78•SYNTAX ≤ 22A (7)A (8)0•Isolated left main stenosisA (7)A (9)80•Isolated left main stenosisA (7)A (9)80•Isolated left main stenosisA (7)A (9)81•Isolated left main stenosisA (7)A (9)81•Isolated left main stenosisA (7)A (9)82•SYNTAX ≥ 33I (3)A (9)83•No diabetesA (7)A (9)84•SYNTAX 23-32A (7)A (9)83•No diabetesA (7)A (9)84•SYNTAX 23-32A (7)A (8)84•SYNTAX ≤ 22A (8)A (8)85•SYNTAX ≥ 33I (3)A (9)86•SYNTAX ≥ 33I (3)A (9)87•DiabetesU (5)A (9)88•SYNTAX ≥ 22A (7)A (8)89•Left main stenosis and additional CADA (7)A (8)80•Left main stenosis and additional CADA (7)A (8)81•SYNTAX ≥ 33I (3)A (9)82•SYNTAX ≥ 33I (3)A (9)83•SYNTAX ≥ 33I (3)A (9)84•SYNTAX ≥ 33I (3)A (9)85•SYNTAX ≥ 33I (3)A (9)86•SYNTAX ≥ 33				
Depressed LVEFA• Isolated left main stenosisA (7)79• No diabetes80• Isolated left main stenosis81• Isolated left main stenosis81• Depressed LVEF82• SYNTAX ≥ 33• No diabetes• Normal LVEF82• SYNTAX ≥ 33• Iceft main stenosis and additional CAD83• SYNTAX ≥ 33• Normal LVEF• Left main stenosis and additional CAD83• SYNTAX 23~32• No diabetes• Normal LVEF• Left main stenosis and additional CAD84• SYNTAX 23~32• No diabetes• Normal LVEF• Left main stenosis and additional CAD84• SYNTAX ≤ 22• No diabetes• Normal LVEF• Left main stenosis and additional CAD84• SYNTAX ≥ 33• SYNTAX ≥ 33• Left main stenosis and additional CAD85• SYNTAX ≥ 33• Left main stenosis and additional CAD86• SYNTAX ≥ 33• Left main stenosis and additional CAD87• Left main stenosis and additional CAD88• SYNTAX ≥ 22• Diabetes• Diabetes• Diabetes• Left main stenosis and additional CAD87• SYNTAX ≥ 33• Left main stenosis and additional CAD88• SYNTAX ≥ 33• Left main stenosis and additional CAD89• Left main stenosis and additional CAD80• Left main		1		
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	•	Depressed LVEF		
	•	Left main stenosis and additional CAD		
90	•	SYNTAX ≤ 22	A (7)	A (8)
	•	Depressed LVEF		
	•	Prior bypass surgery with native 3-vessel		
		disease and failure of multiple bypass		
91		grafts	A (7)	U (6)
	•	LIMA remains patent to native coronary	11(7)	0 (0)
		artery		
	•	Depressed LVEF		
	•	Prior bypass surgery with native 3-vessel		
		disease and failure of multiple bypass		
92		grafts	I (3)	A (9)
12	•	LIMA was used as a graft but is no	1(5)	$\Lambda(\mathcal{I})$
		longer functional		
	•	Depressed LVEF		

- 26 CAD: coronary artery diseases; LVEF: left ventricular ejection fraction; LIMA: left internal
- 27 mammary artery.

29	1.2. Image Analysts Training and Testing
30	
31	STANDARD OPERATING PROCEDURE
32	
33	
34	SOP Number: 1.0
35	Title: Angiographic Analyst Training
36	Effective Date: December 01, 2012
37	
38	
39	PURPOSE
40	To establish a standardized Angiographic Analyst training system in order to ensure the
41	highest accuracy and quality of analysis output from the core lab.
42	
43	SCOPE
44	This procedure applies to all Core Laboratory Angiogram analysts.
45	
46	RESPONSIBILITIES
47	Department Head and senior Angiographic Analyst
48	
49	PROCEDURE
50	1.1 Every employee should receive at least one year of training on angiographic
51	analysis before becoming a qualified analyst.
52	1.2 A dedicated senior Angiographic Analyst, under the supervision of the

53	Department Head, is assigned to train the trainees.
54	1.3 Anatomy of the cardiovascular system:
55	1.3.1 Senior Angiographic Analyst teaches the anatomy using provided teaching
56	materials (PowerPoint, heart model, and relevant books).
57	1.3.2 Trainees learn the anatomy of the cardiovascular system through review of
58	angiograms (at least 50 cases per day).
59	1.3.3 The senior Angiographic Analyst should arrange an examination on the
60	anatomy of the cardiovascular system every week (content of the examination
61	decided by the senior Angiographic Analyst).
62	1.3.4 Only when the trainees master the anatomy of the cardiovascular system
63	will the next lesson be taught.
64	1.4 SYNTAX Score
64 65	1.4 SYNTAX Score 1.4.1 Senior Angiographic Analyst teaches SYNTAX score using provided
65	1.4.1 Senior Angiographic Analyst teaches SYNTAX score using provided
65 66	1.4.1 Senior Angiographic Analyst teaches SYNTAX score using provided teaching materials (PowerPoint, example cases, SYNTAX score website,
65 66 67	1.4.1 Senior Angiographic Analyst teaches SYNTAX score using provided teaching materials (PowerPoint, example cases, SYNTAX score website, and SYNTAX score calculator).
65 66 67 68	 1.4.1 Senior Angiographic Analyst teaches SYNTAX score using provided teaching materials (PowerPoint, example cases, SYNTAX score website, and SYNTAX score calculator). 14.2 Trainees learn SYNTAX score calculation through practice (at least 30
65 66 67 68 69	 1.4.1 Senior Angiographic Analyst teaches SYNTAX score using provided teaching materials (PowerPoint, example cases, SYNTAX score website, and SYNTAX score calculator). 14.2 Trainees learn SYNTAX score calculation through practice (at least 30 cases a day).
65 66 67 68 69 70	 1.4.1 Senior Angiographic Analyst teaches SYNTAX score using provided teaching materials (PowerPoint, example cases, SYNTAX score website, and SYNTAX score calculator). 14.2 Trainees learn SYNTAX score calculation through practice (at least 30 cases a day). 1.4.3 Senior Angiographic Analyst reviews the cases calculated by trainees
65 66 67 68 69 70 71	 1.4.1 Senior Angiographic Analyst teaches SYNTAX score using provided teaching materials (PowerPoint, example cases, SYNTAX score website, and SYNTAX score calculator). 14.2 Trainees learn SYNTAX score calculation through practice (at least 30 cases a day). 1.4.3 Senior Angiographic Analyst reviews the cases calculated by trainees every day and corrects any mistakes.

75	1.4.5 To become a qualified SYNTAX score calculator, trainees should pass the
76	final test.
77	1.4.5.1 50 cases are selected, including cases with total occlusion lesion,
78	bifurcation, trifurcation, tortuosity, calcification, thrombus, and small
79	diffuse disease.
80	1.4.5.2 The trainees and a qualified analyst calculate the SYNTAX scores,
81	and they perform a second analysis 4-6 weeks later.
82	1.4.5.3 Scores are calculated independent of each other and their original
83	results. A biostatistician provides a kappa statistic for the SYNTAX
84	score. kappa ≥ 0.8 will be considered acceptable agreement.
85	1.5 Qualitative and Quantitative Angiographic Analysis
86	1.5.1 Senior Angiographic Analyst teaches Qualitative and Quantitative
87	Angiographic Analysis using provided teaching materials (PowerPoint,
88	example cases, and computer software systems: Medis's Cardiovascular
89	Measurement System and Pie Medical Imaging's CAAS).
90	1.5.2 Trainees learn analysis through practice (at least 2 cases per day).
91	1.5.3 Senior Angiographic Analyst reviews the cases analyzed by trainees every
92	day and corrects any mistakes.
93	1.5.4 Senior Angiographic Analyst should arrange an examination on
94	Qualitative and Quantitative Angiographic Analysis every week (content
95	of the examination decided by the senior Angiographic Analyst).
96	1.5.5 To become a qualified Angiographic Analyst, trainees should pass the final

97	test.	
98	1.5.5.1 30 cases are selected, with a range of characteristics (e.g.,	
99	calcification, thrombus, dissection, perforation).	
100	1.5.5.2 The trainees and a qualified analyst perform the Qualitative and	
101	Quantitative Angiographic Analysis, and they perform a second	
102	analysis 4-6 weeks later.	
103	1.5.5.3 Analysis is completed independent of each other and their origina	ıl
104	results. A biostatistician provides a kappa statistic for all	
105	continuous variables assessed in the test. kappa ≥ 0.8 will be	
106	considered acceptable agreement.	
107	1.6 Intensive training. After the training in our Angiographic Core Lab, trainees are	e
108	sent to the internationally recognized Angiographic Core Lab of the	
109	Cardiovascular Research Foundation (USA) for a two-week training lesson.	
110	1.7 Quality Control	
111	1.7.1 The Angiographic Core Lab conducts an inter-and intra- variability test, a	at
112	a minimum of every other year. Variability testing serves as continuing	
113	training documentation, demonstrating knowledge and understanding o	of
114	the definitions and quantitative coronary angiography techniques, with	a
115	goal of kappa ≥ 0.8 . Parameters with poor agreement are revisited during	ng
116	group training. If necessary, consistent outliers for individual readers an	re
117	followed up on with individual training and additional monitoring.	
118	1.7.2 30 cases are selected. The criterion for selection is single percutaneous	

119	coronary intervention (PCI) lesions. The selected cases represent a wide
120	range of characteristics (e.g., calcification, thrombus, dissection, and
121	perforation). All cases will have documented diagnostic and guiding
122	catheter sizes.
123	1.7.3 Each analyst is assigned a unique identifier to differentiate each reader
124	in the data. The team performs an independent initial read of all cases and
125	enters the results into the database. They perform a second analysis 4-6
126	weeks later, independent of each other and their original results. A
127	biostatistician provides a kappa statistic for each categorical variable and
128	the intra-class correlation for all continuous variables assessed in the test.
129 130	

131 **1.3. Clinical endpoint definitions**

- 132 **Death** was defined as death from any cause. The cause of death will be adjudicated as
- 133 being due to cardiac death or non-cardiac death.
- 134 Myocardial infarction (MI)
- 135 <u>In-hospital MI</u>: Defined as the occurrence during hospitalization after PCI, CABG or
- 136 coronary angiography meeting at least 1 of the following criteria:
- 137 1. The rise in cardiac troponin I (cTnI) is \geq 70 times the 99th percentile URL (where the
- 138 baseline is lower than the
- 139 URL, elevated and stable, or falling).
- 140 2. If cTnI was not available, MI was defined with at least one of the following:
- 141 New ischaemic ECG changes;
- 142 Development of new pathological Q waves;
- Imaging evidence of loss of viable myocardium that is presumed to be new and in a
- 144 pattern consistent with an ischaemic etiology;
- Angiographic findings consistent with a procedural flow-limiting complication such as
- 146 coronary dissection, occlusion of a major epicardial artery or graft, side-branch
- 147 occlusion-thrombus, disruption of collateral flow or distal embolization.
- 148 Spontaneous MI: Defined as detection of a rise and/or fall of cTn values with at least one
- value above the 99th percentile URL after discharge and with at least one of the following:
- Symptoms of acute myocardial ischemia;
- 151 New ischaemic ECG changes;
- 152 Development of pathological Q waves;

• Imaging evidence of new loss of viable myocardium or new regional wall motion		
abnormality in a pattern consistent with an ischaemic etiology;		
• Identification of a coronary thrombus by angiography including intracoronary imaging or		
by autopsy		
Stroke was confirmed by a neurologist on the basis of imaging studies and was		
defined as follows:		
1. A focal neurologic deficit of central origin lasting >72 hours, or		
2. A focal neurologic deficit of central origin lasting >24 hours, with imaging evidence		
of cerebral infarction or intracerebral hemorrhage, or		
3. A non-focal encephalopathy lasting >24 hours with imaging evidence of cerebral		
infarction or hemorrhage adequate to account for the clinical state.		
Repeat revascularization was defined as any repeat coronary artery bypass graft (CABG)		
or PCI.		
Target Lesion: Lesions were revascularized in the index procedure (or during a planned or		
provisional staged procedure).		
Non-Target Vessel: Lesions were not treated by either PCI or CABG at the index		

169 procedure.

170 **1.4. Supplementary materials for statistical analysis**

171 Statistics for primary and secondary outcomes

172 For primary outcome, we used both multivariable logistic regression models and

173 hierarchical logistic regression models to examine the associations between the

174 intervention and the inappropriate revascularization. Model candidate variables of interests

included patient demographics (age, sex) and AUC scenario variables (including number of

antianginal medications, symptom, extent of coronary diseases and stress test,

177 Supplemental material 1.2), as well as cardiologist annual PCI volume. We used

178 multivariable hierarchical logistic regression (random effect cardiologist PCI caseload) to

select the variables associated with primary outcome (Supplemental Table 1.4.1). Finally,

age, symptom and annual PCI volume (random effect) were selected for hierarchical

181 logistic regression model for primary outcome. And age and symptom were selected for

182 logistic regression models for primary outcome.

For secondary outcomes about revascularization decision making, we used the same multivariable logistic regression models and hierarchical logistic regression models in primary outcome analysis.

186 Statistics for subgroups analysis

Subgroup analyses about the associations between the intervention and the decision making
were also conducted using hierarchical logistic regression models as mentioned in primary
outcome analysis.

190 Statistics for one-year outcomes

191 Multivariable Cox proportional models were used to adjust for the potential impact of

192 confounding factors between the intervention and one-year outcomes. Model candidate

193 variables of interests were selected based on clinical knowledge that included

194 demographics (age, sex), severity of angina, extent of coronary artery disease, cardiac risk

195 factors, comorbidities, cardiac history and procedural information. We used univariate

- analysis to select the variables associated with one-year major adverse cardiac events
- 197 (Supplemental Table 1.4.2). Finally, age, SYNTAX score, extent of coronary disease,

- 198 previous heart failure, peripheral vascular disease, CAD family history, procedural
- 199 information (medical therapy, PCI or CABG) were selected for the model.

200	Supplemental Table 1.4.1. Multivariable hierarchical logistic regression of

001	• • • • • • • •
201	inappropriate revascularization
201	muppi oprince i e vuseului izution

Variables	Adjusted OR (95% CI)	Р
Patients characteristics		
Age	0.98 (0.973-0.995)	0.005
Men	0.769 (0.577-1.025)	0.074
Number of antianginal medications		
0	Ref	
1	0.942 (0.749–1.186)	0.614
2	1.068 (0.855–1.335)	0.561
3	0.923 (0.692–1.230)	0.583
Symptom		
No angina	Ref	
Symptomatic	0.013 (0.006-0.027)	< 0.001
Study group (intervention group)	0.832 (0.725–0.956)	0.009
Cardiologist characteristics		
Annual PCI volume		
Low (≤412/year)	Ref	
Medium (413–615/year)	2.492 (1.542-4.027)	0.002
High (>615/year)	1.919 (1.337-2.756)	0.003

202 Hierarchical multivariable logistic regression cannot be done for extent of coronary disease

and stress test, because few primary outcomes occurred in one of the groups. CI:

204 confidence interval; OR: odds ratio; Ref: reference.

Variables	HR (95% CI)	Р
Age (years), mean±SD	1.017 (1.005–1.029)	0.004
Men	0.936 (0.720-1.216)	0.619
SYNTAX score	1.049 (1.040–1.058)	< 0.001
Extent of coronary disease		
Mild disease (50%–69% stenosis)	Ref	
1 vessel	2.962 (1.427-6.146)	0.004
2 vessels	5.456 (2.677–11.347)	< 0.001
3 vessels	9.196 (4.475–18.883)	< 0.001
Left main stenosis	8.589 (4.132–18.594)	< 0.001
Severity of chest pain		
No angina	Ref	
CCS class I–II	0.993 (0.789–1.250)	0.953
CCS class III–IV	1.577 (1.064–2.338)	0.023
Left ventricular ejection		
Not assessed	Ref	
≤35%	3.464 (0.458–26.227)	0.229
36%-50%	1.442 (0.776–2.680)	0.247
>50%	0.906 (0.539–1.524)	0.710
Cardiac history		
Previous myocardial infarction	1.009 (0.756–1.346)	0.951
Previous heart failure	2.051 (1.201-3.505)	0.009
Previous PCI	0.949 (0.745-1.210)	0.675
Cerebrovascular disease	1.265 (0.931-1.720)	0.133
Peripheral vascular disease	1.495 (1.008–2.217)	0.046
Cardiac risk factors and medical comorb	idities	
Hypertension	1.087 (0.867–1.363)	0.469
Hyperlipidemia	0.830 (0.660-1.043)	0.110
Diabetes	1.111 (0.879–1.405)	0.377
Smoked during the last year	1.117 (0.897–1.391)	0.324
CAD family history	2.913 (1.087-7.810)	0.034
COPD	0.531 (0.075-3.778)	0.527

206 Supplemental Table 1.4.2. Univariate analysis for one-year major adverse cardiac events

207 All baseline variables were used for single-factor analysis. Finally, we selected age,

208 SYNTAX score, extent of coronary disease, previous heart failure, peripheral vascular

209 disease, CAD family history. SD: standard deviation; CABG: coronary artery bypass graft;

210 CAD: coronary artery disease; COPD: chronic obstructive pulmonary disease; CI: confidence

211 interval; HR: hazard ratio; PCI: percutaneous coronary intervention.

212 II. Supplementary Tables

213 Supplementary Table 1. Cardiologist characteristics.

No.	Seniority	PCI volume	CA volume	Rate of PCI/CA (%)	Accuracy of SYNTAX score tertiles assessment (%)	Rate of overestimation (%)	Rate of underestimation (%)	Overestimation by two levels * (%)	Overestimation by one level † (%)
1	Chief	1359	2334	40.5	57.1	42.9	0.0	28.6	14.3
2	Chief	615	1167	52.7	75.7	21.4	2.9	4.8	16.6
3	Chief	693	1137	73.6	82.4	14.2	3.4	5.5	8.7
4	Chief	543	757	45.5	83.4	14.0	2.6	3.1	10.9
5	Associate	917	2076	62.1	76.9	23.1	0.0	5.1	18.0
6	Associate	528	905	71.7	77.0	21.1	1.9	3.3	17.8
7	Associate	412	892	56.5	82.9	17.1	0.0	7.5	9.6
8	Associate	476	766	60.9	75.8	20.1	4.1	2.7	17.4
9	Associate	307	758	58.2	58.8	40.3	0.9	13.9	26.4
10	Attending	340	748	44.2	90.1	9.3	0.6	1.4	7.9
11	Attending	440	598	46.2	82.1	16.2	1.7	6.0	10.2
12	Attending	298	527	58.3	77.2	19.8	3.0	2.5	17.3

Information on cardiologist SYNTAX score assessment was based on agreement on the SYNTAX score tertile assessment between the image analysts and cardiologists in the control group. * Overestimation by two levels indicates that the scores were misestimated from low (0–22) to high risk (\geq 33). [†] Overestimation by one level indicates that the scores were misestimated from low (0–22) to intermediate risk (23–32), or from intermediate (23–32) to high risk (\geq 33). CA: coronary angiography; PCI: percutaneous coronary intervention; SYNTAX: Synergy Between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery.

Outcomes	Control (<i>n</i> =1498)	Intervention (SYNTAX score feedback)	Unadjuste	d	Adjusted for patient characteristics		
	(1-1490)	(<i>n</i> =1682)	HR (95% CI)	Р	HR (95% CI)	Р	
MACE *	152 (10.1)	168 (10.0)	0.99 (0.79–1.23)	0.912	0.94 (0.75–1.17)	0.570	
Death from all cause †	9 (0.6)	15 (0.9)	1.34 (0.55–3.28)	0.521	-	-	
Cardiac death †	3 (0.2)	8 (0.5)	2.23 (0.43–11.51)	0.337	-	-	
Non-cardiac death †	6 (0.4)	7 (0.4)	1.04 (0.35–3.10)	0.940	-	-	
Myocardial infarction	57 (3.8)	76 (4.5)	1.17 (0.83–1.66)	0.362	1.15 (0.81–1.62)	0.435	
Repeat revascularization	93 (6.2)	86 (5.1)	0.82 (0.61–1.10)	0.194	0.77 (0.58–1.04)	0.085	
TVR	62 (4.1)	59 (3.5)	0.85 (0.60–1.21)	0.369	0.80 (0.56–1.14)	0.210	
Non-TVR	31 (2.1)	27 (1.6)	0.77 (0.46–1.30)	0.328	0.70 (0.42–1.18)	0.183	

220 Supplementary Table 2. One-year clinical outcomes in the control and intervention groups

Data were presented as n (%). One-year clinical outcomes were adjusted for age, SYNTAX score, extent of coronary disease, prior heart failure,
 CAD family history, and peripheral vascular disease. * MACE includes death, myocardial infarction, repeat revascularization at one year. [†]Because of
 the small number of death, adjustment was not done. -: not applicable. CI: confidence interval; HR: hazard ratio; MACE: major adverse cardiac
 events; TVR: target vessel revascularization; SYNTAX: Synergy Between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery.

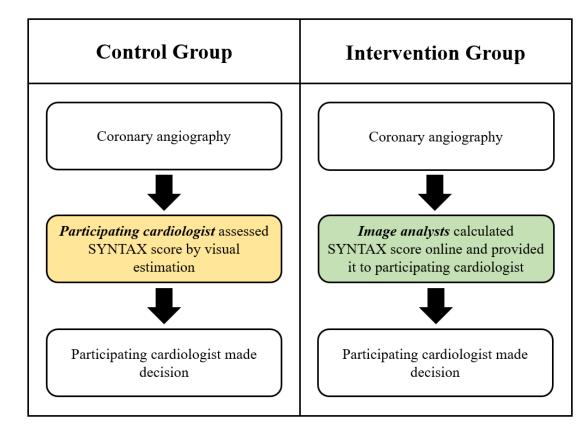
226 Supplemental Table 3. One-year clinical outcomes in subgroups of different treatment strategies

Outcomes	Control	SYNTAX score	Unadjuste	d	Adjusted for patient characteristics		
		feedback	HR (95% CI)	Р	HR (95% CI)	Р	
MACE (PCI subgroup) *	96/870 (11.0)	103/951 (10.8)	0.99 (0.75–1.30)	0.914	0.90 (0.68–1.19)	0.456	
MACE (CABG subgroup) *	19/104 (18.3)	15/107 (14.0)	0.76 (0.39–1.49)	0.423	0.62 (0.30–1.27)	0.191	
MACE (Medical therapy subgroup) *	37/487 (7.1)	50/624 (8.0)	1.15 (0.75–1.75)	0.529	1.07 (0.69–1.64)	0.774	

227 Data were presented as *n* (%). One-year clinical outcomes were adjusted for age, SYNTAX score, extent of coronary disease, prior heart failure,

228 CAD family history, and peripheral vascular disease. * MACE includes death, myocardial infarction, repeat revascularization at one year. CI:

229 confidence interval; HR: hazard ratio; MACE: major adverse cardiac events; TVR: target vessel revascularization.



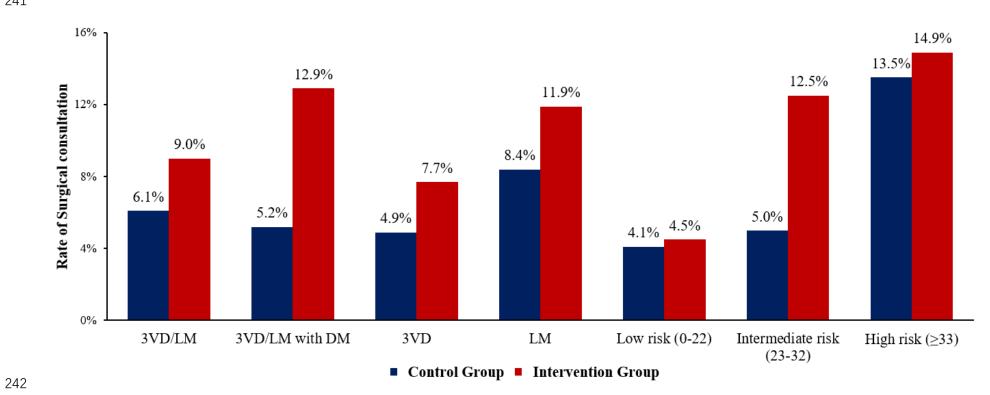
- 233 Supplementary Figure 1. Decision-making procedures in the control group and
- 234 the intervention group. SYNTAX: Synergy Between Percutaneous Coronary
- 235 Intervention with Taxus and Cardiac Surgery.

	PCI Inappropriateness - Events/Total (%)			Adjusted Odds Ratio	p-Value	PCI Utilization - Events/Total (%)				Adjusted Odds Ratio	p-Value
	Control	SYNTAX score feedback		(95% CI)	p-value	Control	SYNTAX score feedback			(95% CI)	p-value
Age, yrs ≥65 years <65 years	64/497 (12.9) 174/1028 (16.9)	65/530 (12.3) 148/1190 (12.4)	- - ■-1 -■-1	1.01 (0.67 to 1.53) 0.74 (0.57 to 0.97)	0.962 0.027	257/497 (51.7) 637/1028 (62.0)	288/530 (54.3) 688/1190 (57.8)		F 8 4	1.07 (0.83 to 1.38) 0.81 (0.67 to 0.95)	0.599 0.011
Gender Male Female	191/1183 (16.1) 47/342 (13.7)	175/1368 (12.8) 38/352 (10.8)		0.81 (0.63 to 1.04) 0.87 (0.52 to 1.47)	0.100 0.608	715/1183 (60.4) 179/342 (52.3)	790/1368 (57.7) 186/352 (52.8)			0.85 (0.72 to 1.00) 0.99 (0.73 to 1.34)	0.050 0.920
Diabetes mellitus Yes No	66/474 (13.9) 172/1051 (16.4)	59/511 (11.5) 154/1209 (12.7)		0.94 (0.62 to 1.44) 0.75 (0.58 to 0.98)	0.783 0.035	267/474 (56.3) 627/1051 (59.7)	293/511 (57.3) 683/1209 (56.5)		1 4 1	1.01 (0.78 to 1.32) 0.83 (0.69 to 0.98)	0.946 0.030
Hypertension Yes No	136/937 (14.5) 102/588 (17.3)	130/1024 (12.7) 83/696 (11.9)		0.96 (0.72 to 1.28) 0.62 (0.44 to 0.88)	0.783 0.035	548/937 (58.5) 346/588 (58.8)	588/1024 (57.4) 388/696 (55.7)		F a r	0.91 (0.76 to 1.10) 0.84 (0.66 to 1.05)	0.320 0.127
Angina symptom Symptomatic Asymptomatic	9/785 (1.1) 229/740 (30.9)	1/971 (0.1) 212/749 (283)		0.09 (0.01 to 0.67) 0.89 (0.69 to 1.16)	0.018 0.398	486/785 (61.9) 408/740 (55.1)	585/971 (60.2) 391/749 (52.2)			0.85 (0.68 to 1.07) 0.98 (0.86 to 1.12)	0.167 0.804
SYNTAX score tertiles 0-22 ≥23	226/1270 (17.8) 12/255 (4.7)	196/1405 (14.0) 17/315 (5.4)		0.78 (0.60 to 1.01) ⁻¹ 2.18 (0.76 to 6.23)	0.062 0.148	773/1270 (60.9) 121/255 (47.5)	806/1405 (57.4) 170/315 (54.0)		•	0.83 (0.72 to 0.95) 1.49 (0.96 to 2.32)	0.008 0.077
Diseased vessels Mild disease One-vessel Two-vessel Three-vessel Left main *	4/166 (2.4) 133/567 (23.5) 101/398 (25.4) 0/263 (0) 0/131 (0)	2/217 (0.9) 123/624 (19.7) 88/445 (19.8) 0/298 (0) 0/136 (0)		0.35 (0.05 to 2.53) 0.83 (0.68 to 0.99) 0.85 (0.66 to 1.11) -	0.301 0.049 0.233 -	4/166 (2.4) 370/567 (65.3) 297/398 (74.6) 164/263 (62.4) 59/131 (45.0)	2/217 (0.9) 392/624 (62.8) 318/445 (71.5) 207/298 (69.5) 57/136 (41.9)	ı		0.35 (0.05 to 2.53) 0.85 (0.71 to 1.03) 0.78 (0.58 to 1.05) 1.32 (1.12 to 1.54) 0.95 (0.64 to 1.42)	0.301 0.093 0.098 <0.001 0.809
Seniority Attending Associated Chief	42/268 (15.7) 65/450 (14.4) 131/807 (16.2)	38/288 (13.2) 69/614 (11.2) 106/818 (13.0)		1.24 (0.66 to 2.31) 0.75 (0.48 to 1.17) 0.88 (0.63 to 1.24)	0.510 0.204 0.473	147/268 (54.9) 249/450 (55.3) 498/807 (61.7)	152/288 (52.8) 338/614 (55.0) 486/818 (59.4)			1.04 (0.72 to 1.52) 0.98 (0.74 to 1.29) 0.91 (0.73 to 1.14)	0.830 0.864 0.427
		0.01	0.1 1	10			0.01	0.1	1	10	
		Favor SYNTAX	score feedback	avor Control			Favor SYNTAX	score feedbac	ck	Favor Control	

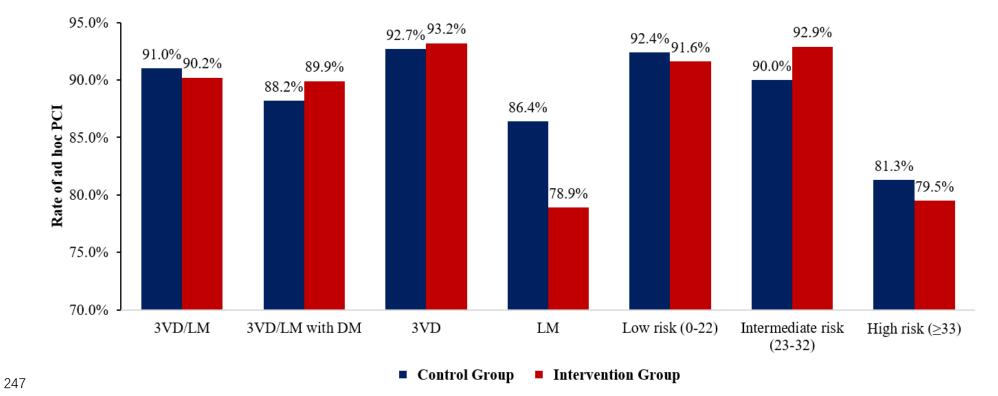
238 **Supplementary Figure 2. Subgroup analyses of inappropriate PCI and PCI utilization.** * No outcomes occurred in the subgroup of triple vessel and

left main disease because revascularization procedures in the present study were all deemed appropriate according to Chinese appropriate use criteria.

240 CI: confidence interval; SYNTAX: Synergy Between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery.



Supplementary Figure 3. Rate of surgical consultation in 3-vessel or left main coronary diseases. Totally, 828 3VD or LM patients were
 analyzed (394 in control group and 434 in intervention group). The rates of surgical consultation were analyzed in different subgroups among
 828 patients. 3VD: 3-vessel coronary diseases; LM: left main coronary disease; DM: diabetes mellitus.



Supplementary Figure 4. Rate of ad hoc PCI in 3-vessel or left main coronary diseases. Totally, 487 3VD or LM patients treated by PCI were analyzed (223 in control group and 264 in intervention group). The rates of ad hoc PCI were analyzed in different subgroups among 487 patients. 3VD: 3-vessel coronary diseases; DM: diabetes mellitus; LM: left main coronary disease; PCI: percutaneous coronary intervention.