Ischemic and bleeding risk prediction: many scores, little solution

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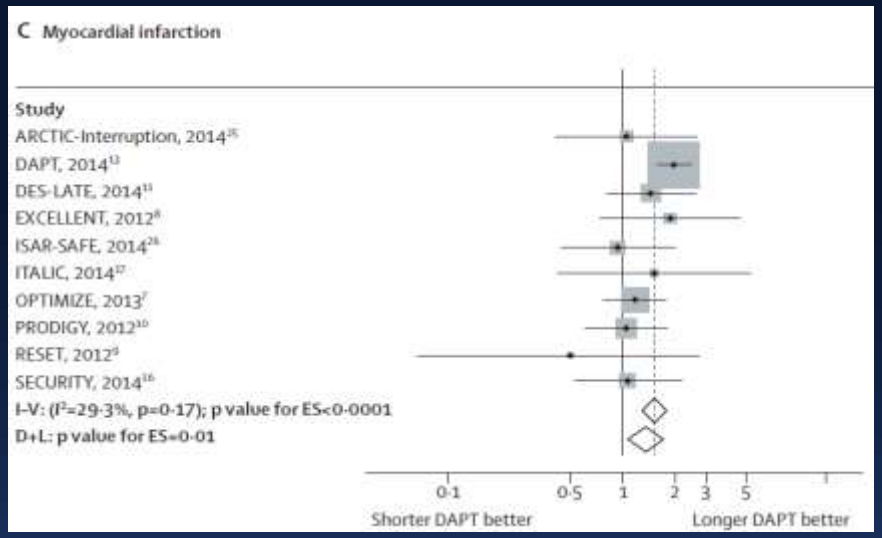
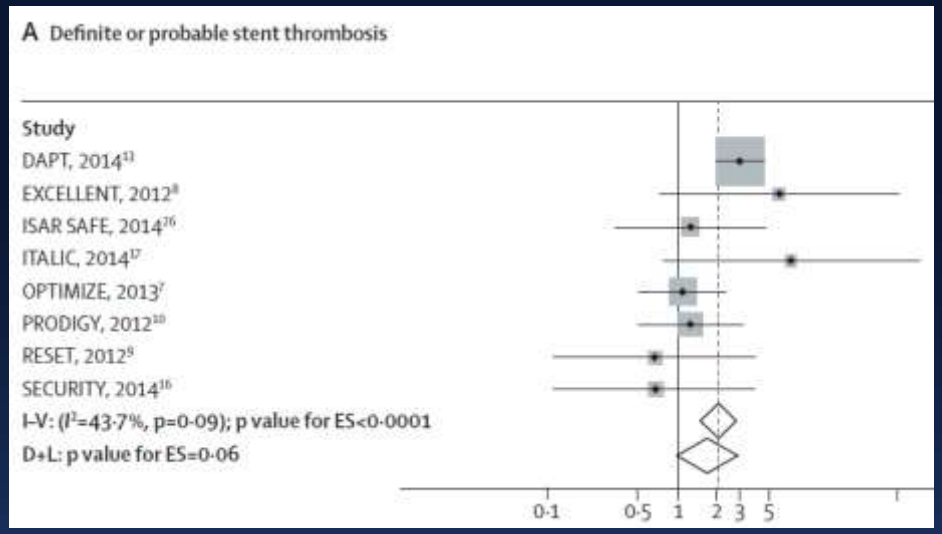
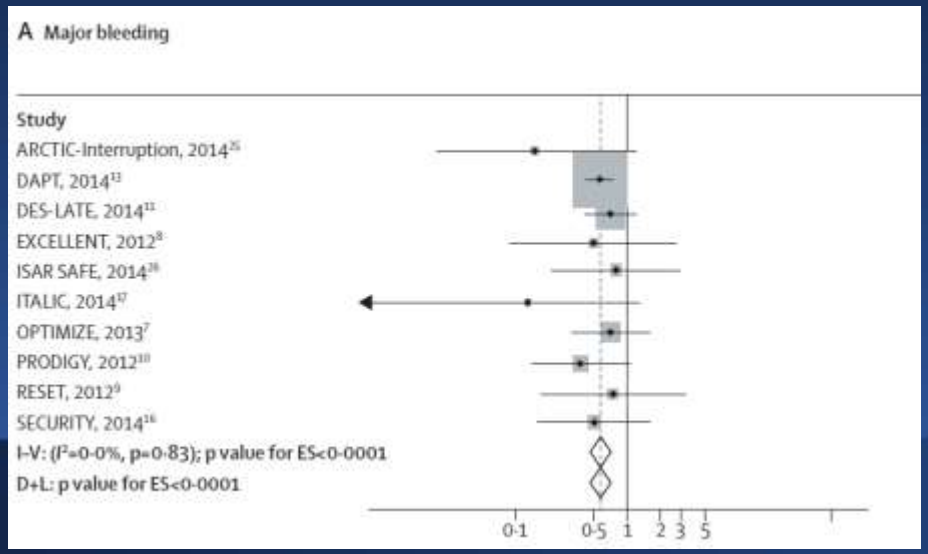
Conflict of interest

- None

Meta-analysis on DAPT duration: 10 RCT with 31,666 patients

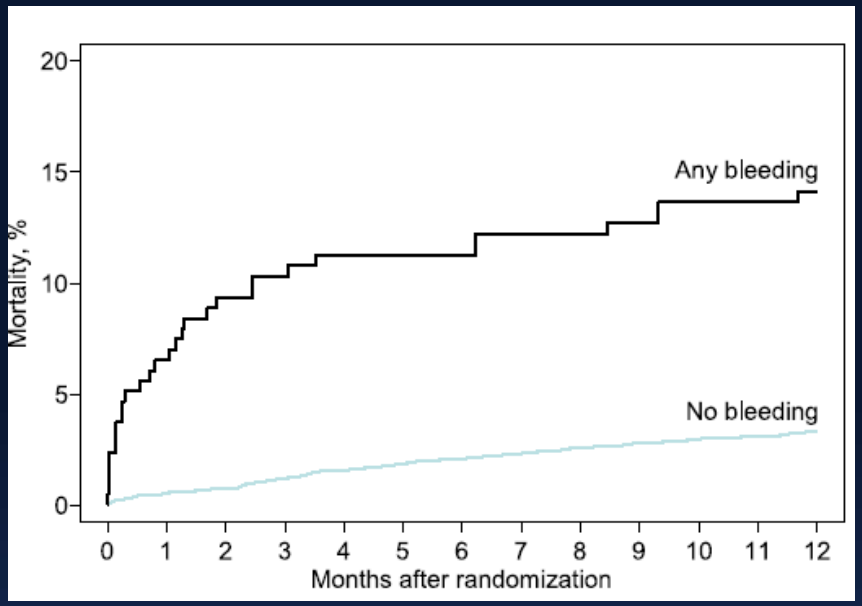






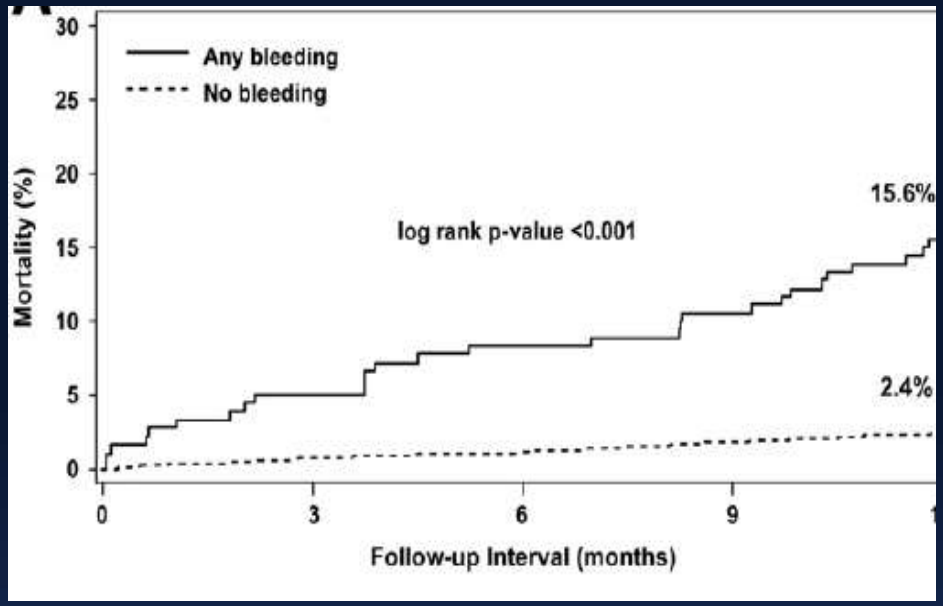
Palmerini et al; Lancet 2015

ISAR REACT, SWEET, SMART 2, REACT 2



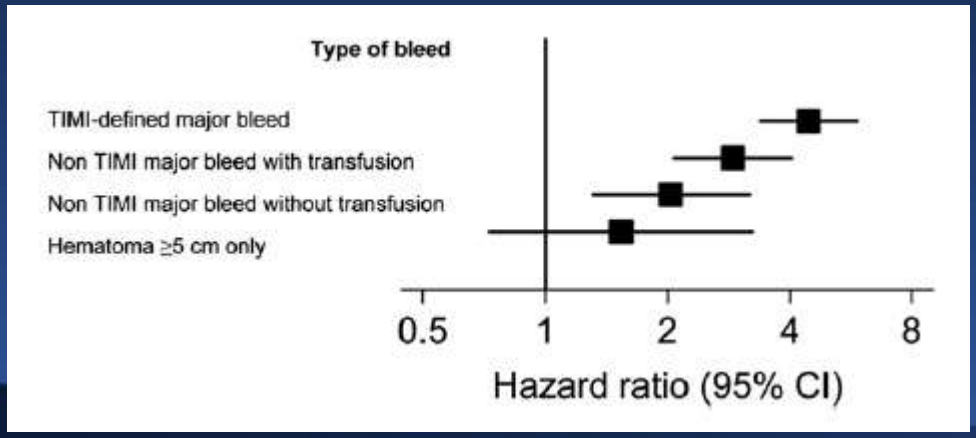
Ndrepepa et al; JACC 2008

EVENT trial



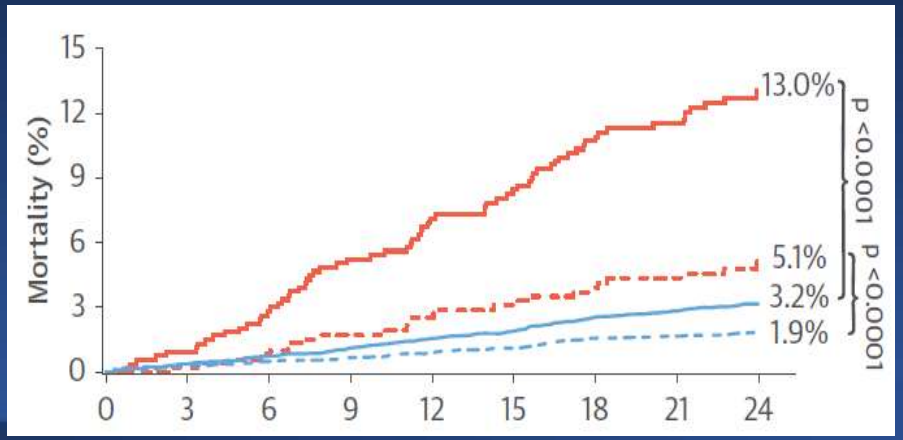
Lindsey et al; JACC Int 2009

ACUITY trial



Mehran et al; JACC 2010

ADAPT DES



Genereux et al; JACC 2015

Bleeding-Related Deaths in Relation to the Duration of Dual-Antiplatelet Therapy After Coronary Stenting

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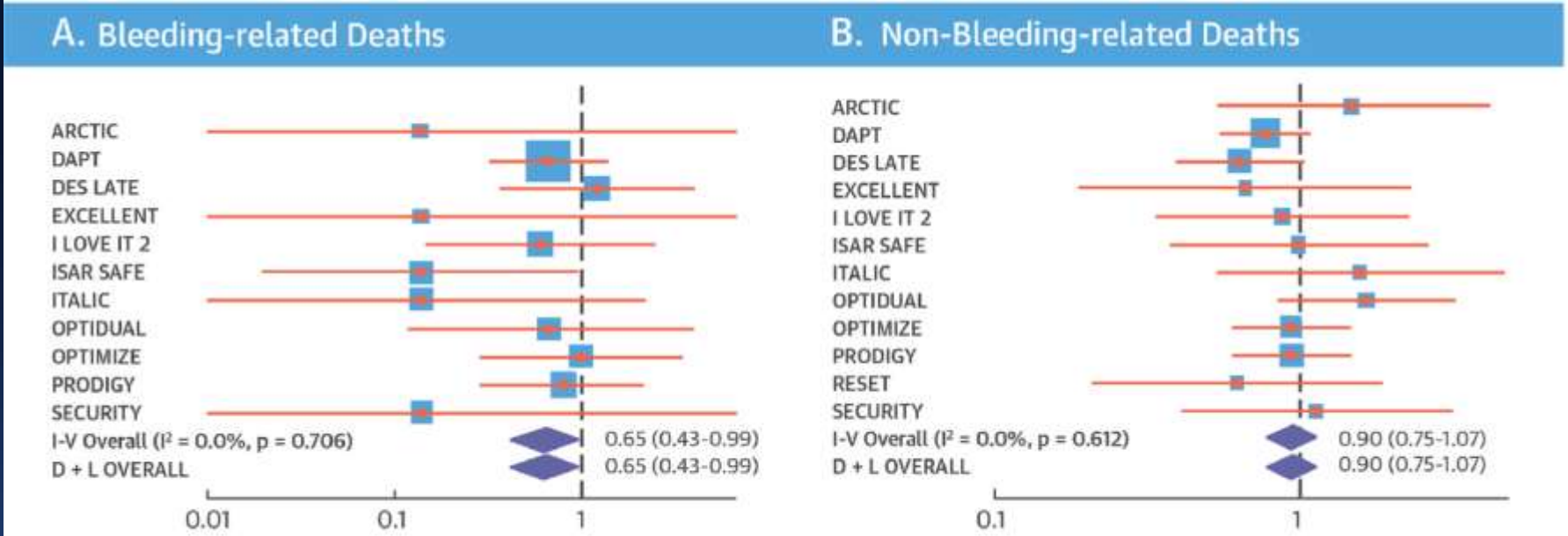
12 randomized studies with 34880 patients

IPD for 6 randomized studies with 11473 patients

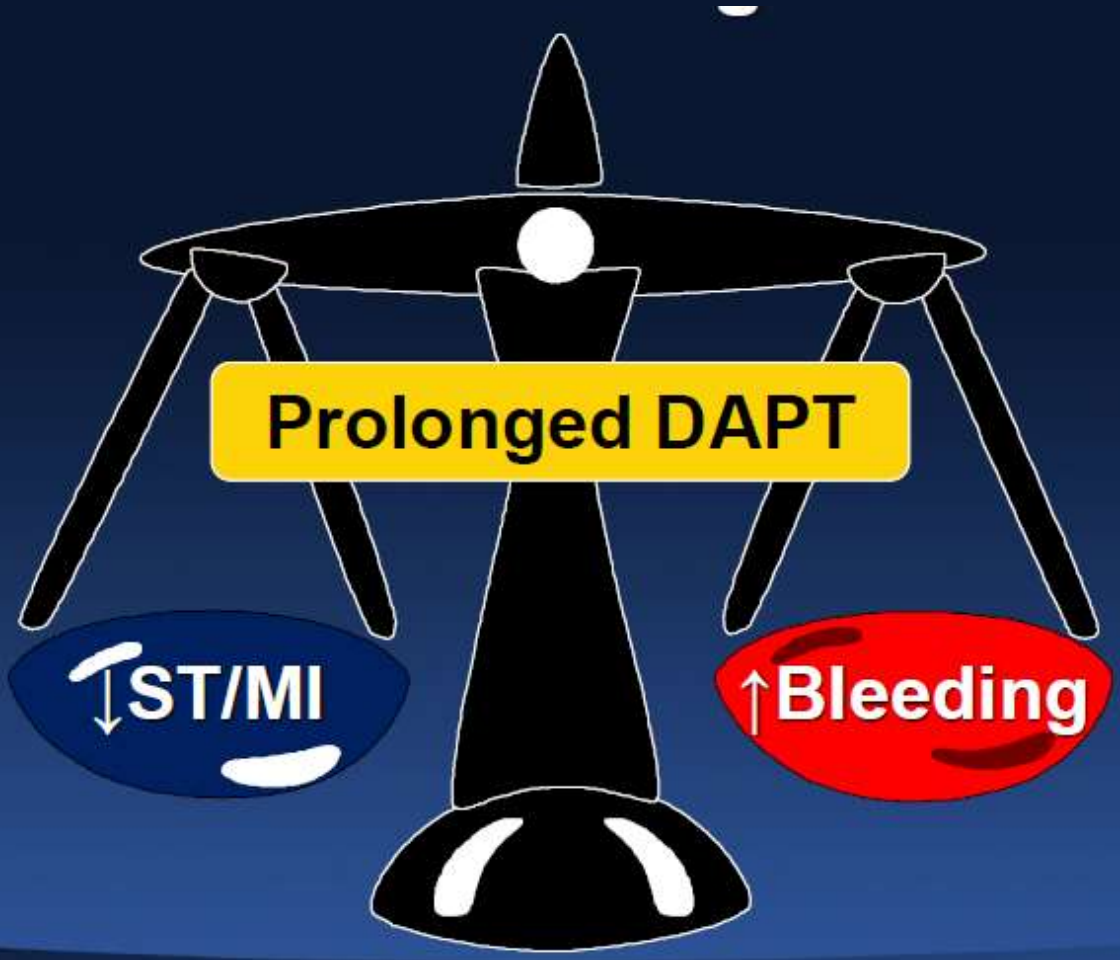
Palmerini et al, JACC 2017

Bleeding related death and DAPT duration



Palmerini, T. et al. J Am Coll Cardiol. 2017;69(16):2011-22.

Tailored therapy to balance the risk of ischemic vs bleeding events



Risk scores for DAPT duration after DES placement

	PRECISE-DAPT score[9]	DAPT score[11]	
Time of use	At the time of coronary stenting	After 12 months of uneventful DAPT	
DAPT duration strategies assessed	Short DAPT (3–6 months) vs. Standard/long DAPT (12–24 months)	Standard DAPT (12 months) vs. Long DAPT (30 months)	
Score calculation*	HB, WBC, Age, CrCl, Prior Bleeding, Score Points	Age	
		≥75	−2 pt
		65 to <75	−1 pt
		<65	0 pt
		Cigarette smoking	+1 pt
		Diabetes mellitus	+1 pt
		MI at presentation	+1 pt
		Prior PCI or prior MI	+1 pt
		Paclitaxel-eluting stent	+1 pt
		Stent diameter <3 mm	+1 pt
		CHF or LVEF <30%	+2 pt
		Vein graft stent	+2 pt
Score range	0 to 100 points	−2 to 10 points	
Decision making cut-off suggested	Score ≥25 → Short DAPT Score <25 → Standard/long DAPT	Score ≥2 → Long DAPT Score <2 → Standard DAPT	

PARIS score

TABLE 4 Integer Risk Score for Major Bleeding

Parameter	Score
Age, yrs	
<50	0
50-59	+1
60-69	+2
70-79	+3
≥80	+4
BMI, kg/m²	
<25	+2
25-34.9	0
≥35	+2
Current smoking	
Yes	+2
No	0
Anemia	
Present	+3
Absent	0
CrCl <60 ml/min	
Present	+2
Absent	0
Triple therapy on discharge	
Yes	+2
No	0

TABLE 5 Integer Risk Score for Coronary Thrombotic Events

Parameter	Score
Diabetes mellitus	
None	0
Non-insulin-dependent	+1
Insulin-dependent	+3
Acute coronary syndrome	
No	0
Yes, Tn-negative	+1
Yes, Tn-positive	+2
Current smoking	
Yes	+1
No	0
CrCl <60 ml/min	
Present	+2
Absent	0
Prior PCI	
Yes	+2
No	0
Prior CABG	
Yes	+2
No	0

Tn = troponin, other abbreviations as in Table 1.

DAPT SCORE: net benefit

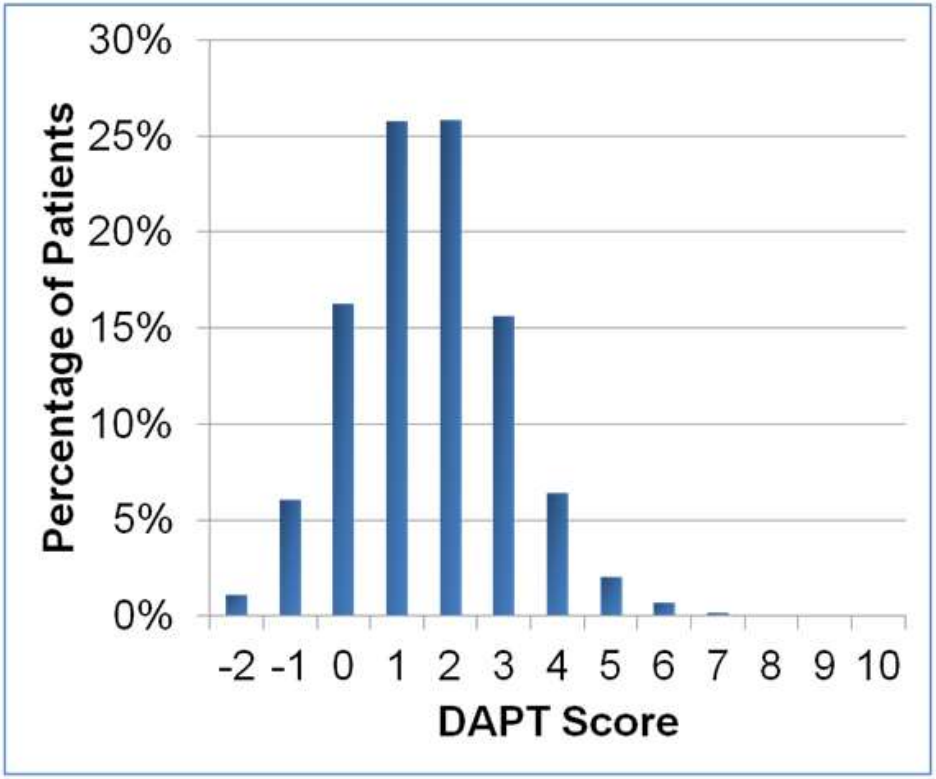
Predictors of Events[a]	Predictors of Myocardial Infarction or Stent Thrombosis[b]		Predictors of Moderate or Severe Bleeding[c]	
	HR (95% CI)	*P* Value	HR (95% CI)	*P* Value
Continued thienopyridine vs placebo	0.52 (0.42-0.65)	<.001	1.66 (1.26-2.19)	<.001
Myocardial infarction at presentation	1.65 (1.31-2.07)	<.001		
Prior PCI or prior myocardial infarction	1.79 (1.43-2.23)	<.001		
History of CHF or LVEF <30%	1.88 (1.35-2.62)	<.001		
Vein graft stent	1.75 (1.13-2.73)	.01		
Stent diameter <3 mm	1.61 (1.30-1.99)	<.001		
Paclitaxel-eluting stent	1.57 (1.26-1.97)	<.001		
Cigarette smoking	1.40 (1.11-1.76)	.01		
Diabetes mellitus	1.38 (1.10-1.72)	.01		
Age, per 10 y			1.54 (1.34-1.78)	<.001
Peripheral arterial disease	1.49 (1.05-2.13)	.03	2.16 (1.46-3.20)	<.001
Hypertension	1.37 (1.03-1.82)	.03	1.45 (1.00-2.11)	.05
Renal insufficiency/failure	1.55 (1.03-2.32)	.04	1.66 (1.04-2.66)	.03

Yeh et al; JAMA 2016

The DAPT Score

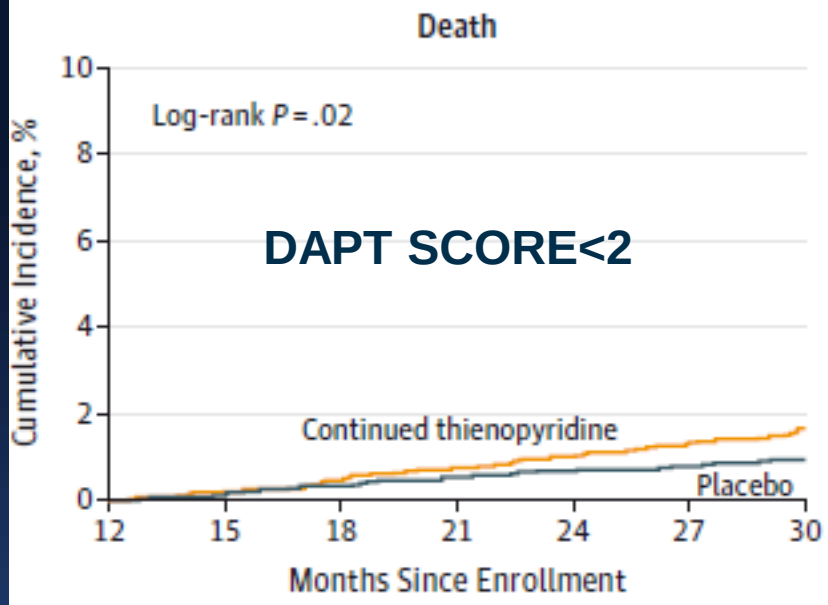
Variable	Points
Patient Characteristic	
Age	
≥ 75	-2
65 - <75	-1
< 65	0
Diabetes Mellitus	1
Current Cigarette Smoker	1
Prior PCI or Prior MI	1
CHF or LVEF < 30%	2
Index Procedure Characteristic	
MI at Presentation	1
Vein Graft PCI	2
Stent Diameter < 3mm	1

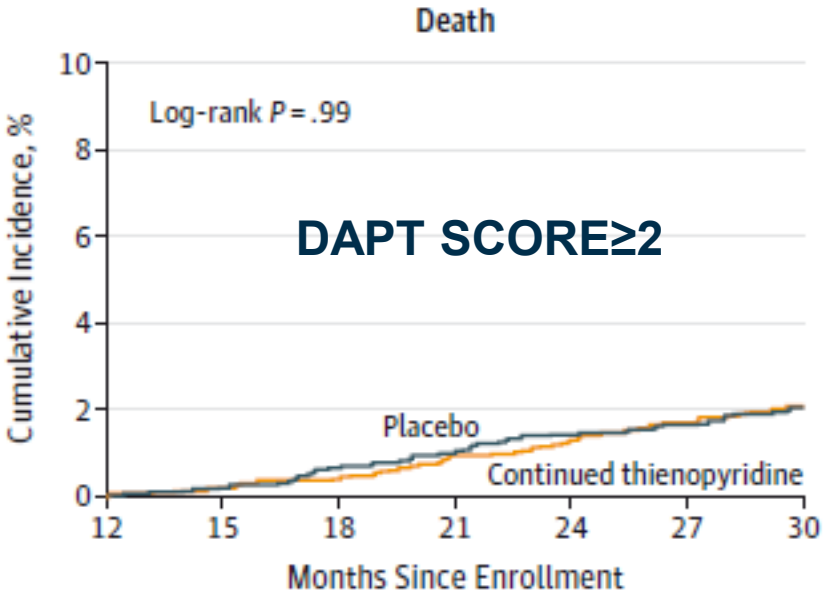
Distribution of DAPT Scores among all randomized subjects in the DAPT Study



Continued Thienopyridine vs. Placebo
High vs. Low DAPT Score

DAPT STUDY





Limitation of the DAPT score

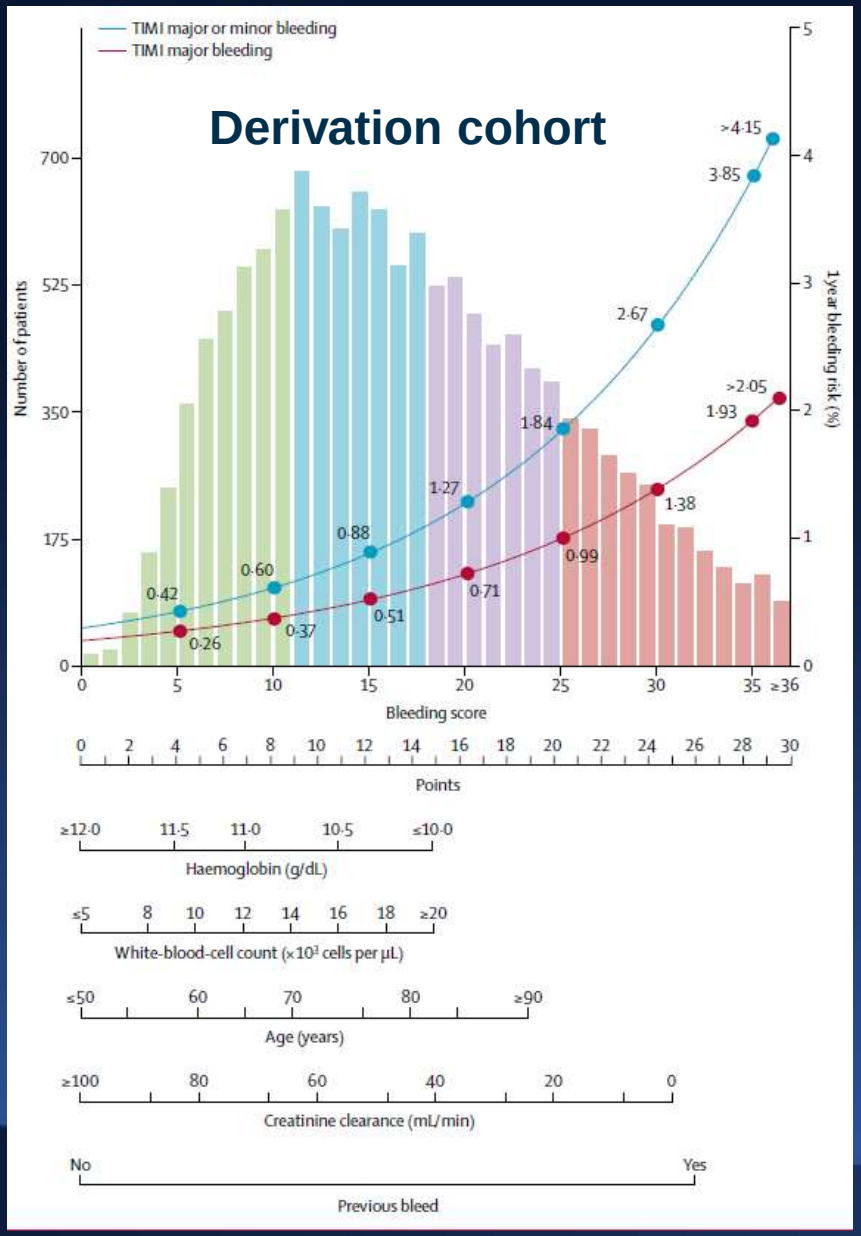
- The validation cohort is questionable (PROTECT trial)
- Post hoc analyses not powerd to examine differences between subgroups
- Mainly patients treated with clopidogrel
- Impossibility to stratify patients upfront
- Low discrimination power
- Several important variable missing (previous bleeding, baseline anemia,…)
- Results influenced by using of I generation DES

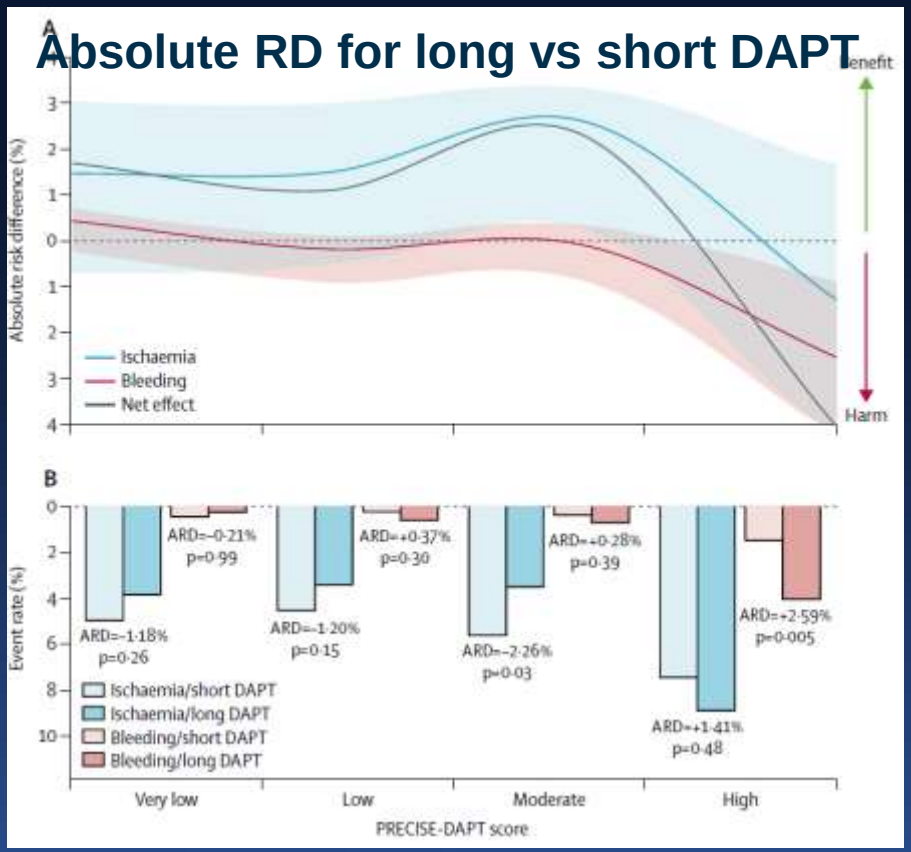
PRECISE DAPT SCORE: focus on bleeding risk (TIMI major and minor)

	Hazard ratio (95% CI)	p value
Age (for each increase of 10 years)	1·34 (1·11–1·48)	0·005
Previous bleeding	4·14 (1·22–14·02)	0·023
White-blood-cell count (for each increase of 10^3 cells per µL)	1·06 (0·99–1·13)	0·078
Haemoglobin at baseline (for each increase of 1 g/dL)	0·67 (0·53–0·84)	0·001
Creatinine clearance (for each increase of 10 mL/min)	0·90 (0·82–0·99)	0·004

Costa et al; Lancet 2017

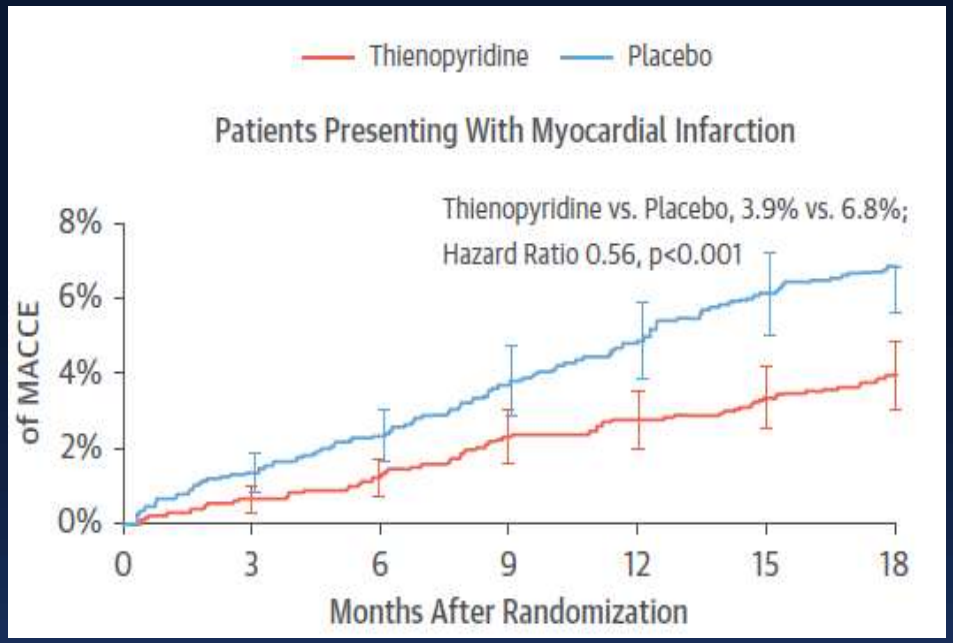
Benefit vs harm with prolonged DAPT



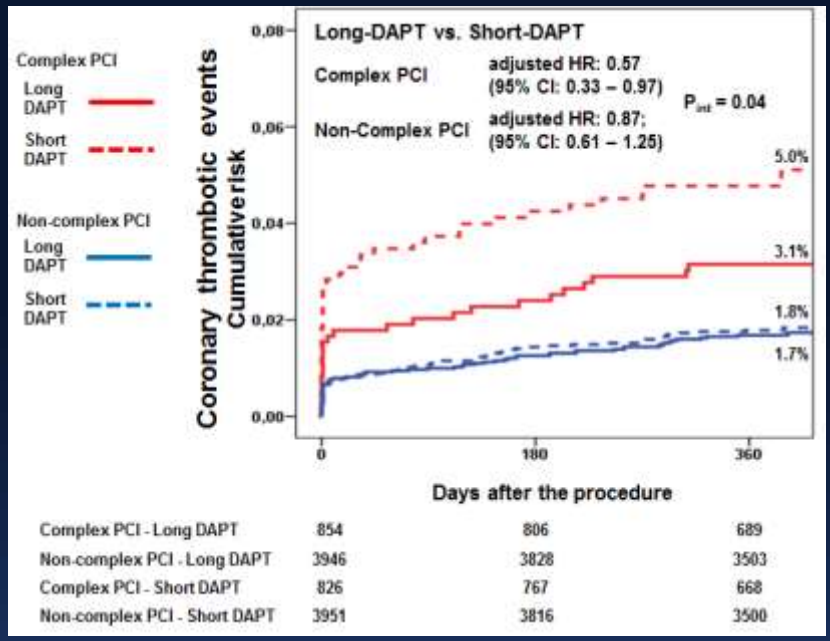


Costa et al; Lancet 2017

Uncertain ischemic boundary



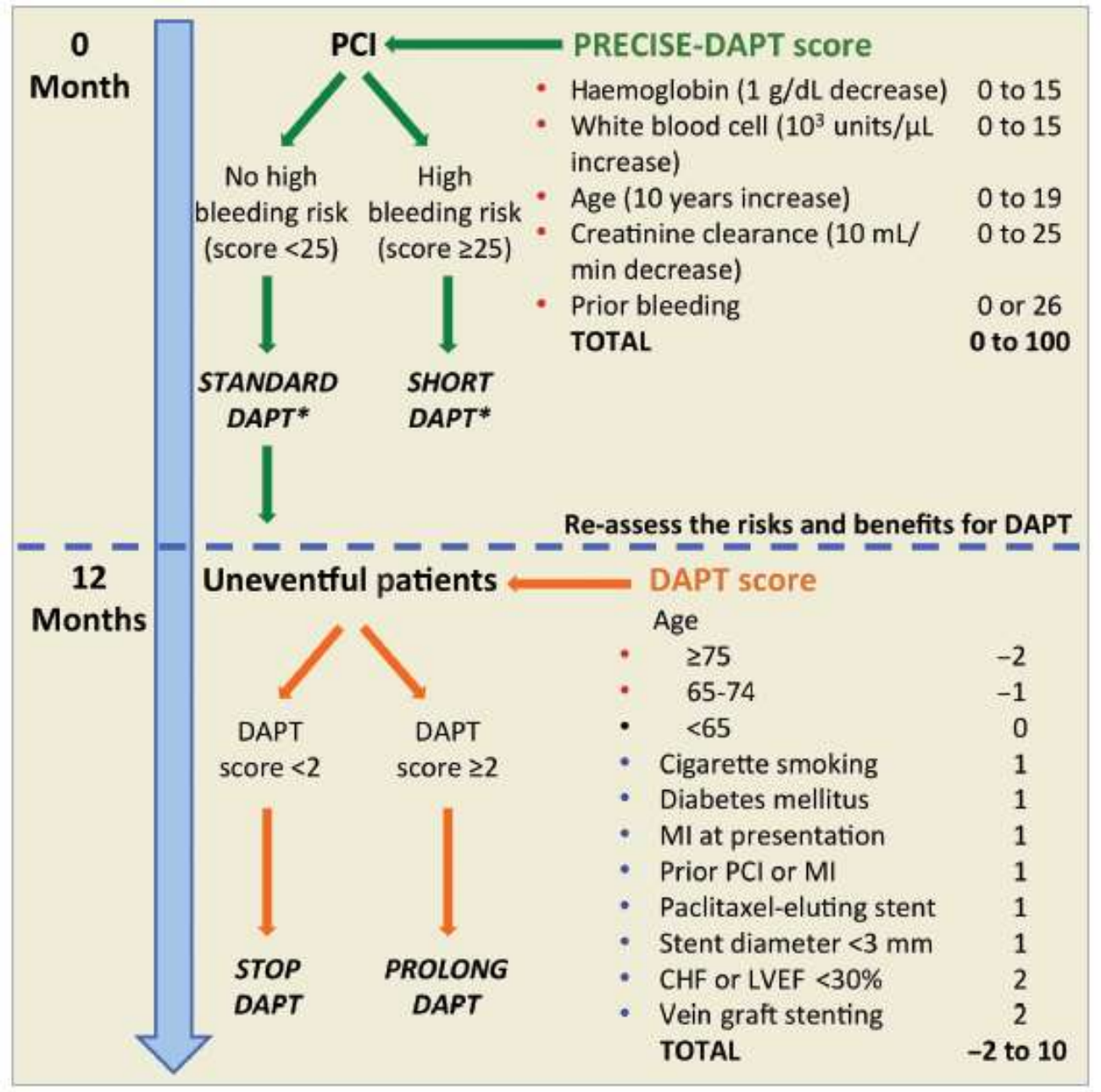
Yeh et al; JACC 2015



Giustino et al; JACC 2016

Cortisone therapy
Anticoagulant therapy
Thrombocytopenia
Severe liver disease

12-month or 24-month DAPT
vs
3-month or 6-month DAPT


0 Month
PCI
PRECISE-DAPT score
Haemoglobin (1 g/dL decrease) 0 to 15
White blood cell (10³ units/µL increase) 0 to 15
Age (10 years increase) 0 to 19
Creatinine clearance (10 mL/min decrease) 0 to 25
Prior bleeding 0 or 26
TOTAL 0 to 100
No high bleeding risk (score <25)
High bleeding risk (score ≥25)
STANDARD DAPT*
SHORT DAPT*
Re-assess the risks and benefits for DAPT
12 Months
Uneventful patients
DAPT score
Age
≥75 −2
65-74 −1
<65 0
Cigarette smoking 1
Diabetes mellitus 1
MI at presentation 1
Prior PCI or MI 1
Paclitaxel-eluting stent 1
Stent diameter <3 mm 1
CHF or LVEF <30% 2
Vein graft stenting 2
TOTAL −2 to 10
DAPT score <2
DAPT score ≥2
STOP DAPT
PROLONG DAPT

PARIS DAPT score

TABLE 4 Integer Risk Score for Major Bleeding

BARC type 3 or 5

Parameter	Score
Age, yrs	
<50	0
50-59	+1
60-69	+2
70-79	+3
≥80	+4
BMI, kg/m^2	
<25	+2
25-34.9	0
≥35	+2
Current smoking	
Yes	+2
No	0
Anemia	
Present	+3
Absent	0
CrCl <60 ml/min	
Present	+2
Absent	0
Triple therapy on discharge	
Yes	+2
No	0

TABLE 5 Integer Risk Score for Coronary Thrombotic Events

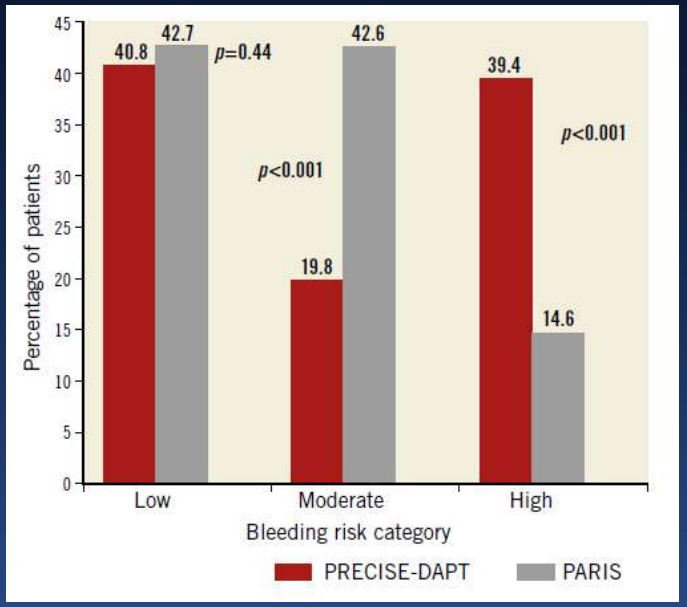
Parameter	Score
Diabetes mellitus	
None	0
Non-insulin-dependent	+1
Insulin-dependent	+3
Acute coronary syndrome	
No	0
Yes, Tn-negative	+1
Yes, Tn-positive	+2
Current smoking	
Yes	+1
No	0
CrCl <60 ml/min	
Present	+2
Absent	0
Prior PCI	
Yes	+2
No	0
Prior CABG	
Yes	+2
No	0

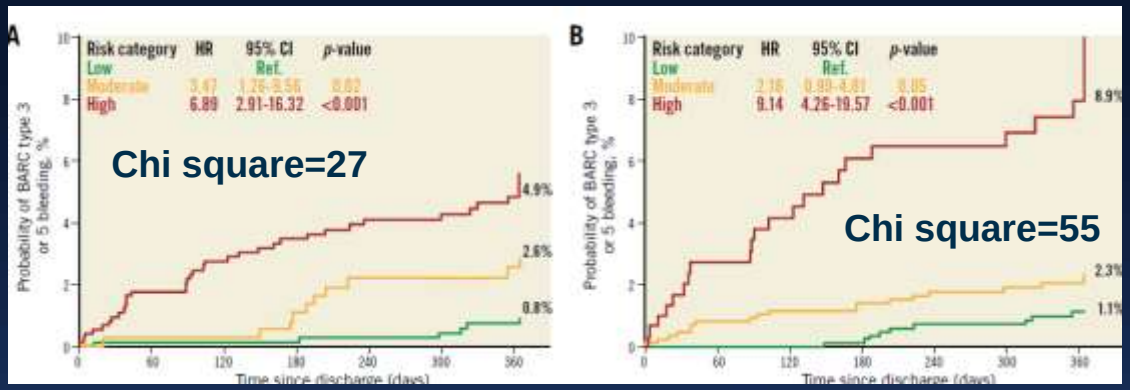
Tn = troponin; other abbreviations as in Table 1.

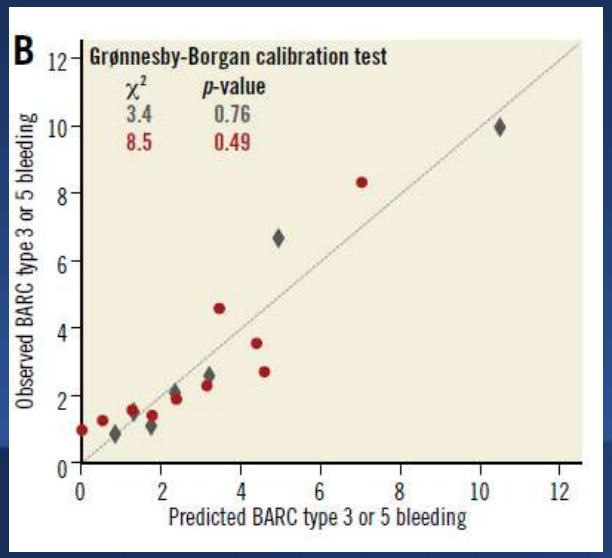
Baber et al; JACC 2016

Assessing the performance of the PRECISE-DAPT and PARIS risk scores for predicting one-year out-of-hospital bleeding in acute coronary syndrome patients

1926 patients with ACS
1-year out of hospital bleeding

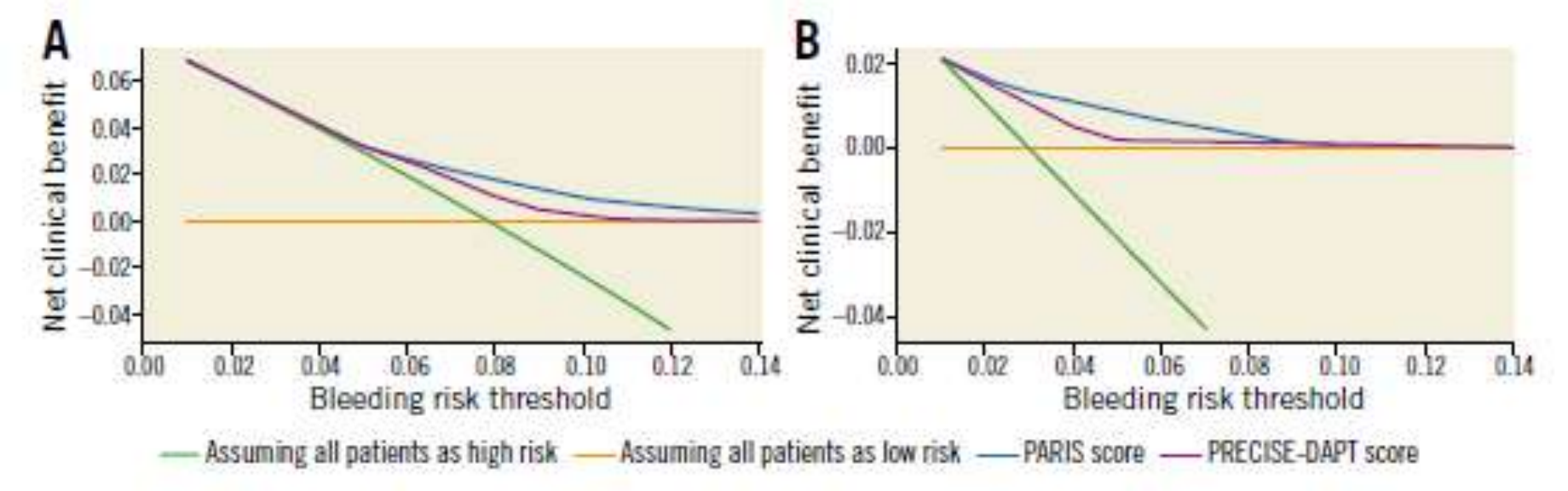




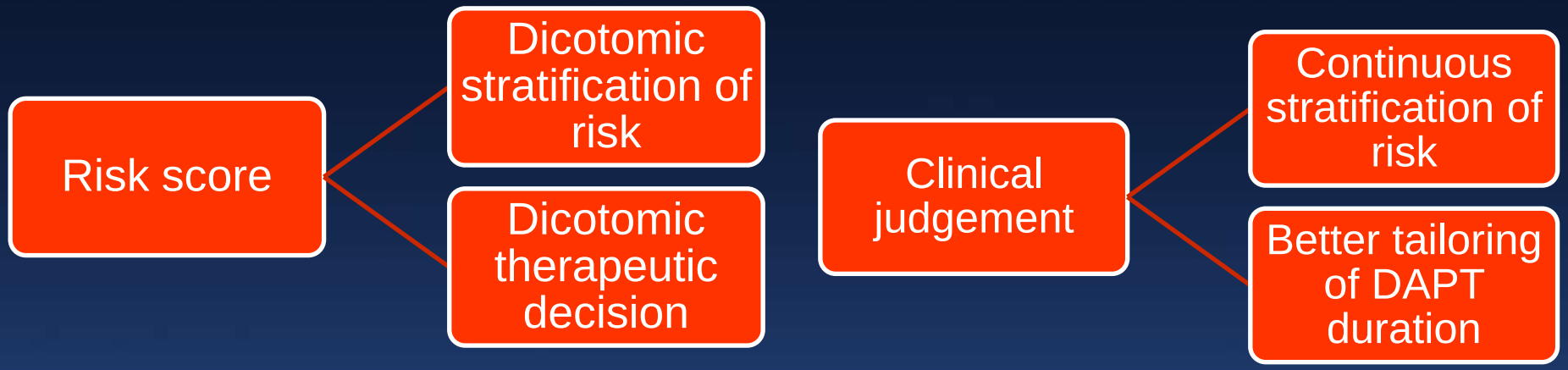


C statistic= 0.73 for both

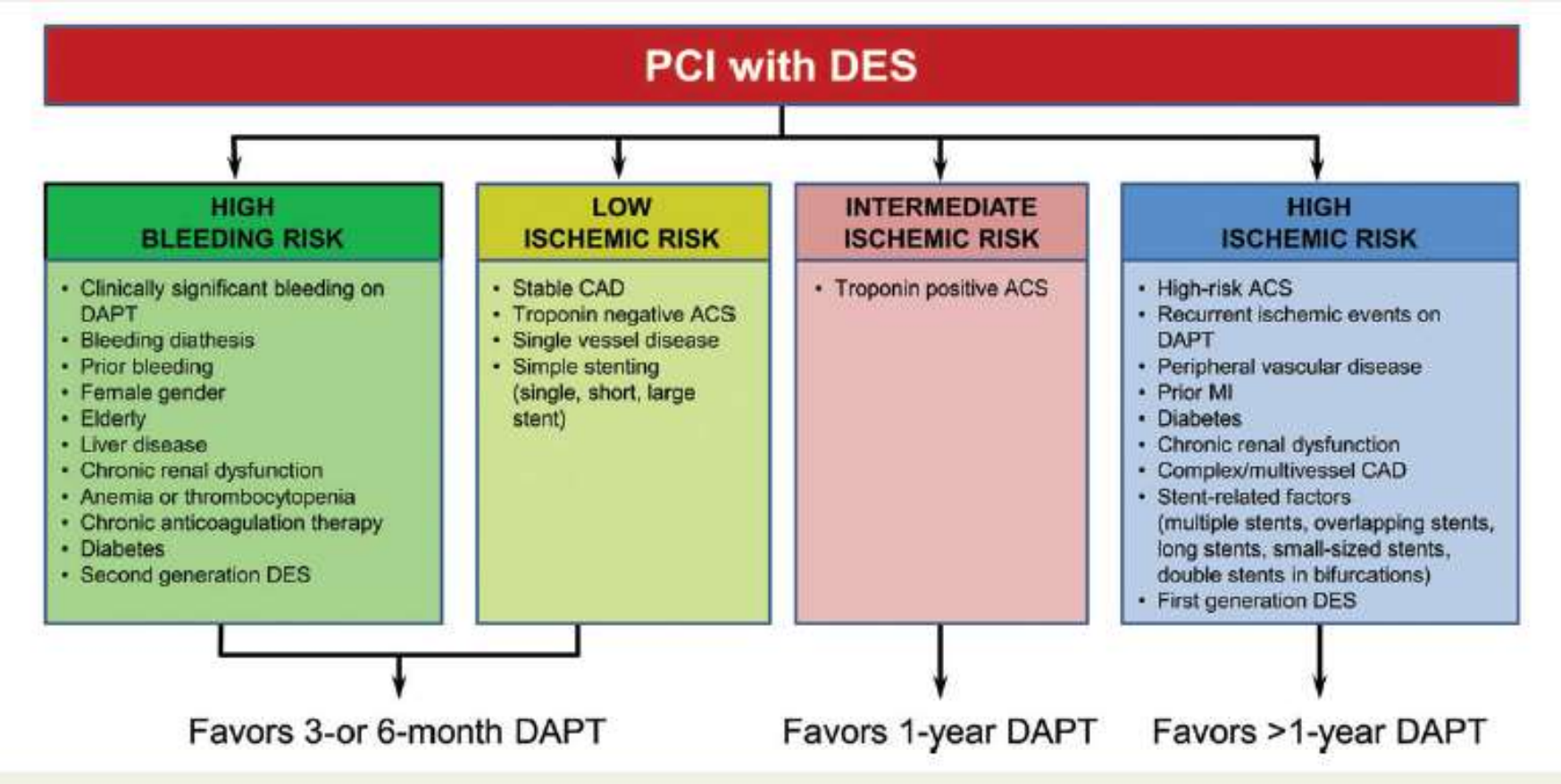
Decision curve analysis



Risk score vs clinical judgments



Clinical judgement vs risk scores



Palmerini and Stone; European Heart Journal 2016

Conclusions

- Longer DAPT reduces the risk of MI and stent thrombosis, but increases the risk of bleeding and bleeding-related death.
- DAPT duration should therefore be individualized according to the ischemic and bleeding risk of indivitual patients
- There are three risk score created to tailor DAPT duration after DES placement, but they have several limitations (not all variables captured, dichotomic stratification).
- There are several nuances when balancing the risk of ischemic vs bleeding events that risk scores cannot capture and therefore their use should always be put after wise clinical judgement.