STAFF DE DOSSIERS

Département de médecine d'urgence
(Pr LEVRAUT)
CHU de Nice

Vendredi 8 septembre 2017

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Centre Hospitalier Universitaire de Nice

Avertissement

La diffusion suivante est réservée à un usage strictement interne des médecins urgentistes du CHU de Nice.

Le contenu présenté ne saurait en aucun cas engager la responsabilité des auteurs.

Une douleur thoracique

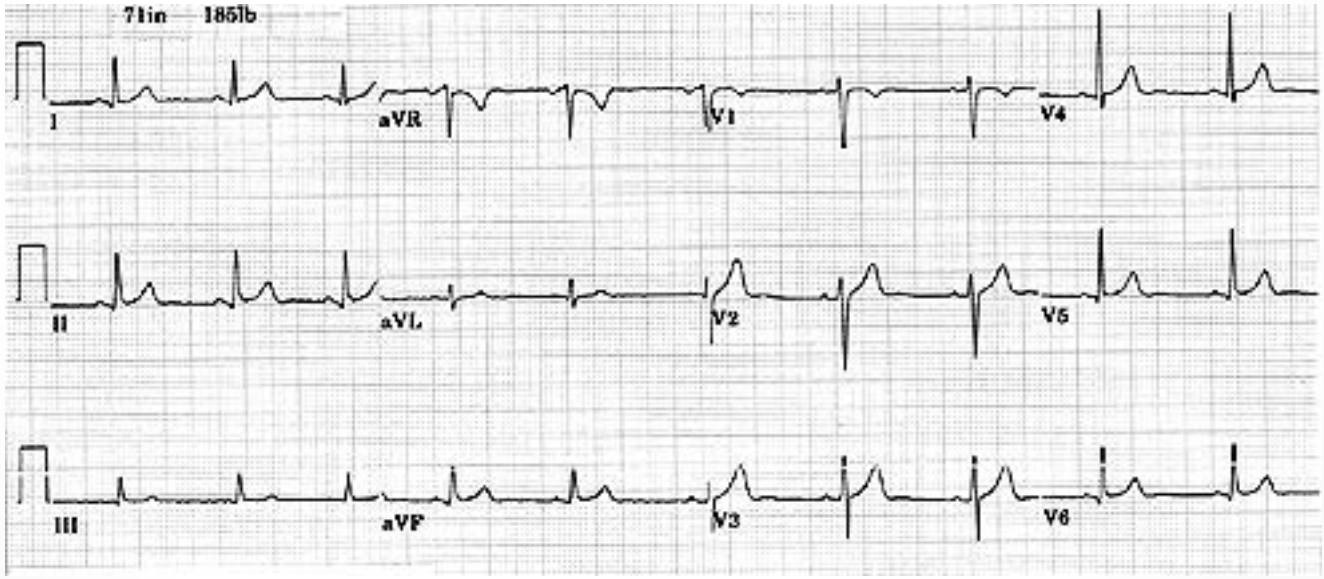
F42, sans ATCD ni FRCV, stressée par son travail

Douleur thoracique rétrosternale, début il y a 1 heure

Douleur comme « un poids », « ça serre ». TA=13/8, FC=65, 99%AA

Moins douloureuse après l'arrivée au SAU, test TNT +/- positif

ECG :



Première tropo : < 17 ng/l

SCA ? Hospi ? 2ème tropo au SAU ? 3ème tropo (on sait jamais) **?**

Une douleur thoracique

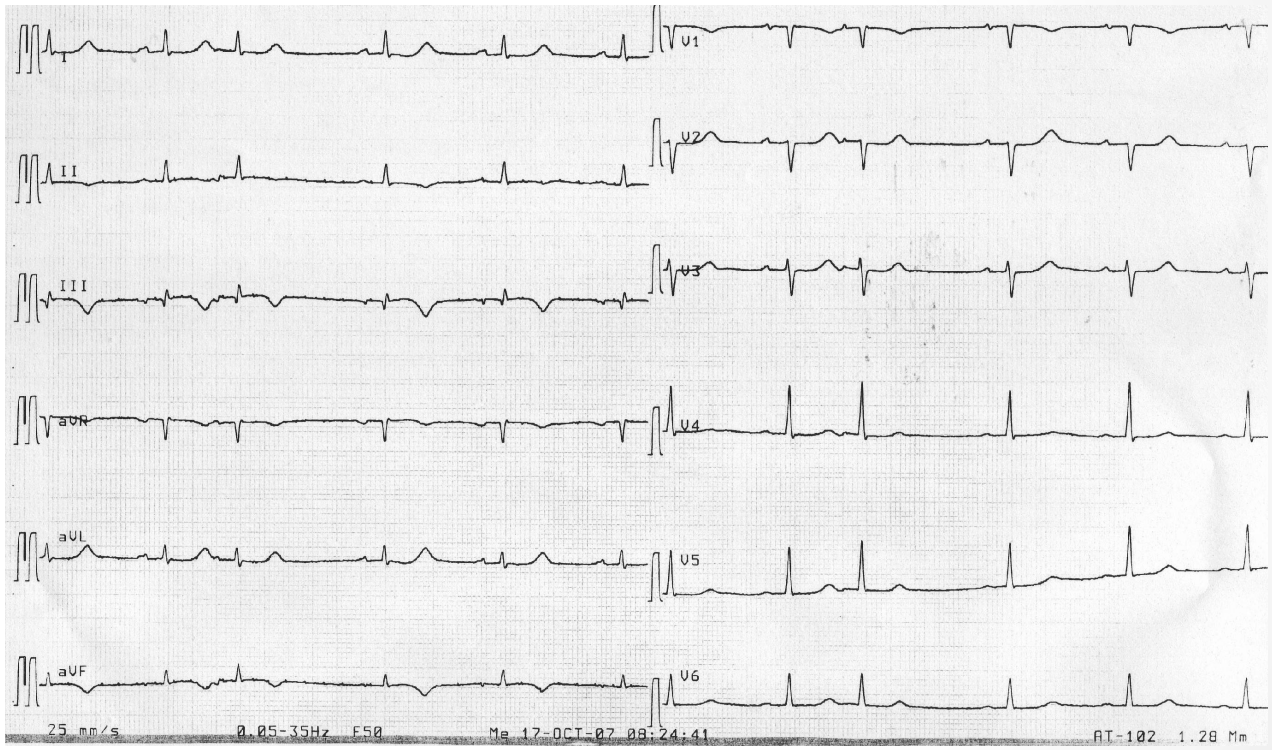
H74, ATCD d'IdM il y a 3 ans, diabétique de type 2

Brûlures épigastriques intermittentes depuis 3 j

ECG :

(pas de modif / ECG de réf.)

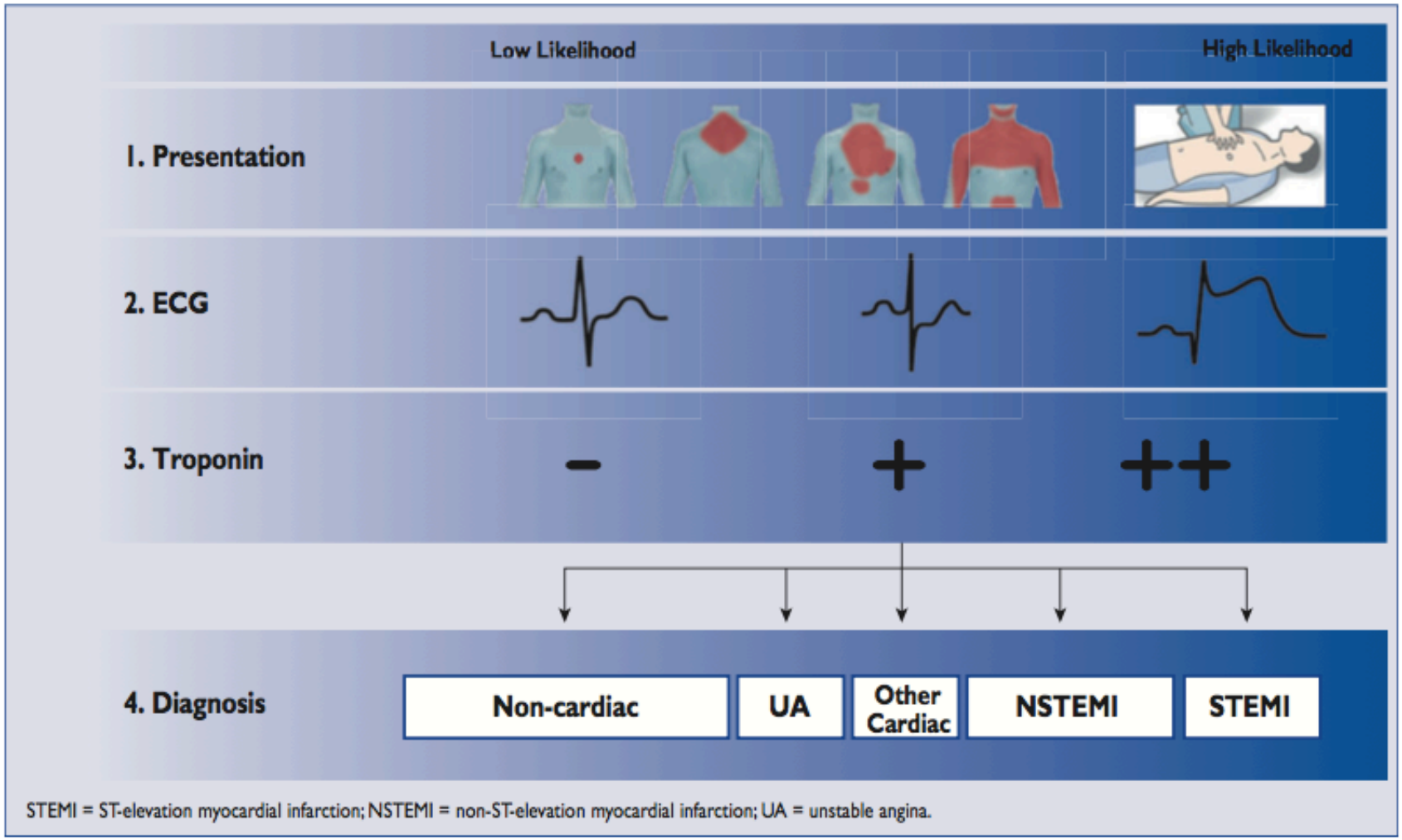
TA=14/7, FC=58, 98%AA



Première tropo : 35 ng/l

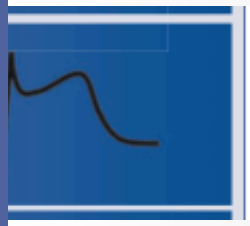
SCA ? Hospi ? 2ème tropo au SAU ou en cardio? 3ème tropo ?

2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation



2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation

	Recommendations	Class[a]	Level[b]
	Diagnosis and risk stratification		
2. ECG	It is recommended to obtain a 12-lead ECG within 10 min after first medical contact and to have it immediately interpreted by an experienced physician. It is recommended to obtain an additional 12-lead ECG in case of recurrent symptoms or diagnostic uncertainty.	I	B



2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation

Table 4 Conditions other than acute myocardial infarction type 1 associated with cardiac troponin elevation

Tachyarrhythmias
Heart failure
Hypertensive emergencies
Critical illness (e.g. shock/ sepsis/ burns)
Myocarditis[a]
Tako-Tsubo cardiomyopathy
Structural heart disease (e.g. aortic stenosis)
Aortic dissection
Pulmonary embolism, pulmonary hypertension
Renal dysfunction and associated cardiac disease
Coronary spasm
Acute neurological event (e.g. stroke or subarachnoid haemorrhage)
Cardiac contusion or cardiac procedures (CABG, PCI, ablation, pacing, cardioversion, or endomyocardial biopsy)
Hypo- and hyperthyroidism
Infiltrative diseases (e.g. amyloidosis, haemochromatosis, sarcoidosis, scleroderma)
Myocardial drug toxicity or poisoning (e.g. doxorubicin, 5-fluorouracil, herceptin, snake venoms)
Extreme endurance efforts
Rhabdomyolysis

3. Troponin

2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation

Table 6 Differential diagnoses of acute coronary syndromes in the setting of acute chest pain

Cardiac	Pulmonary	Vascular	Gastro-intestinal	Orthopaedic	Other
Myopericarditis Cardiomyopathies[a]	**Pulmonary embolism**	**Aortic dissection**	**Oesophagitis, reflus or spasm**	**Musculoskeletal disorders**	**Anxiety disorders**
Tachyarrhythmias	**(Tension)-Pneumothorax**	Symptomatic aortic aneurysm	Peptic ulcer, gastritis	Chest trauma	Herpes zoster
Acute heart failure	Bronchitis, pneumonia	Stroke	Pancreatitis	Muscle injury/ inflammation	Anaemia
Hypertensive emergencies	Pleuritis		Cholecystitis	Costochondritis	
Aortic valve stenosis				Cervical spine pathologies	
Tako-Tsubo cardiomyopathy					
Coronary spasm					
Cardiac trauma					

Bold = common and/or important differential diagnoses.
[a]Dilated, hypertrophic and restrictive cardiomyopathies may cause angina or chest discomfort.

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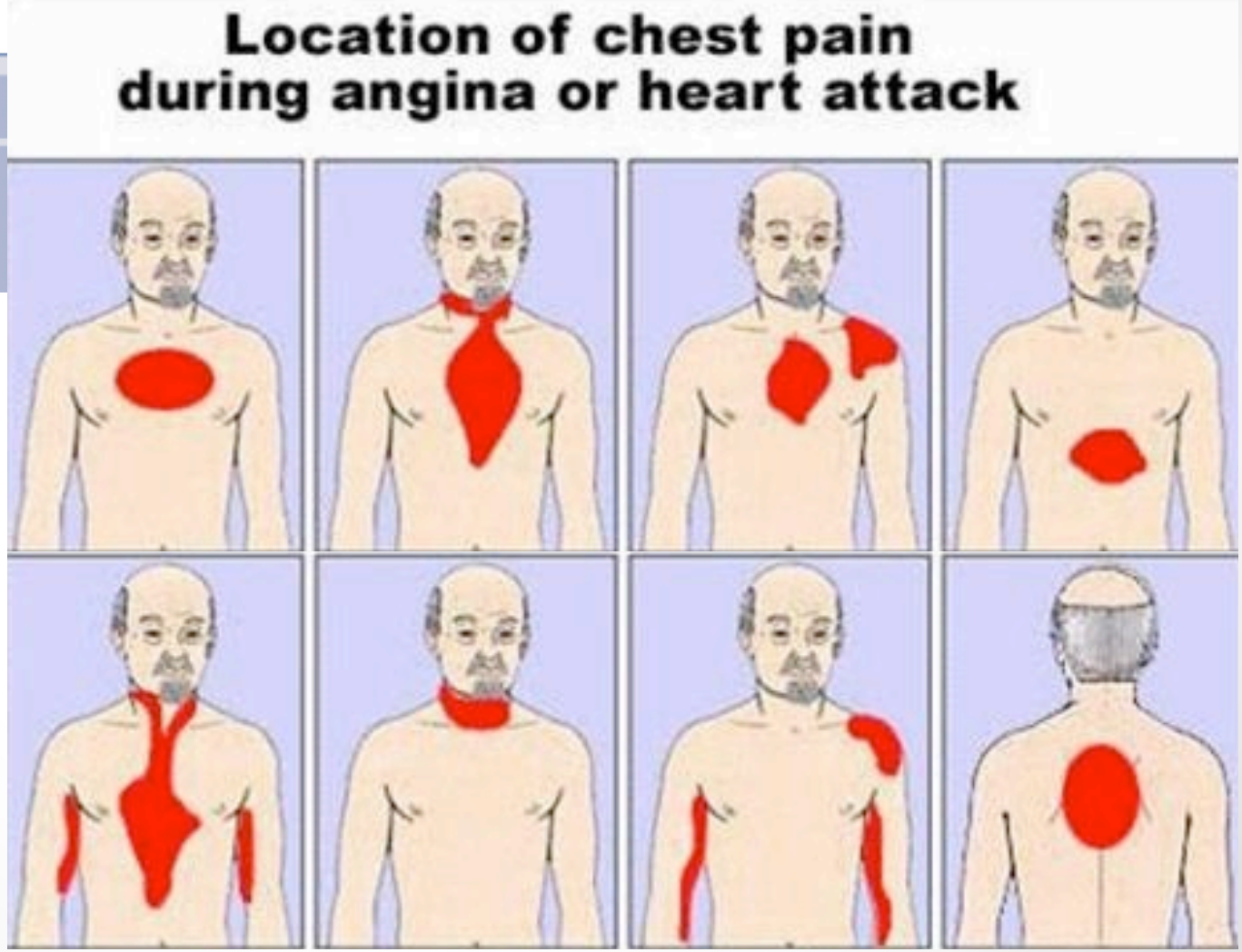
I. Presentation



JAMA. 2015;314(18):1955-1965. doi:10.1001/jama.2015.12735

Does This Patient With Chest Pain Have Acute Coronary Syndrome?

The Rational Clinical Examination Systematic Review

Table 1. Performance of Cardiac Risk Factors in Diagnosing Acute Coronary Syndrome[a]

Test	No. Studies	No. Patients	% (95% CI) Sensitivity	% (95% CI) Specificity	LR+ (95% CI)	I^2, %	LR− (95% CI)	I^2, %	%[b] PPV	%[b] NPV
Abnormal prior stress[c,61]	1	1777	12 (8-16)	96 (95-97)	3.1 (2.0-4.7)		0.92 (0.88-0.96)		32	12
Peripheral arterial disease[21,23,49]	3	6034	7.5 (2-11)	97 (95-99)	2.7 (1.5-4.8)	0	0.96 (0.94-0.98)	64	29	13
Prior CAD[37,40,49,57,60]	5	6396	41 (13-69)	79 (60-98)	2.0 (1.4-2.6)	87	0.75 (0.56-0.93)	96	23	10
Prior myocardial infarction[d]	9	10 491	28 (21-36)	82 (78-86)	1.6 (1.4-1.7)	42	0.88 (0.81-0.93)	81	19	12
Diabetes[e]	9	10 237	26 (21-32)	82 (77-85)	1.4 (1.3-1.6)	4	0.90 (0.86-0.94)	45	17	12
Cerebrovascular disease[21,23,49,70]	4	6682	10 (8-13)	93 (91-94)	1.4 (1.1-1.8)	18	0.97 (0.94-0.99)	14	17	13
Men[f]	12	21 113	66 (62-76)	50 (44-51)	1.3 (1.2-1.3)	65	0.70 (0.64-0.77)	39	16	9
Hyperlipidemia[g]	10	10 288	42 (31-55)	67 (56-79)	1.3 (1.1-1.5)	70	0.85 (0.77-0.93)	69	16	11
Hypertension[h]	11	10 931	59 (53-66)	52 (44-60)	1.2 (1.1-1.3)	51	0.78 (0.72-0.85)	29	15	10
Any tobacco use[i]	9	7 381	38 (28-47)	65 (55-75)	1.1 (0.9-1.3)	75	0.96 (0.85-1.1)	77	14	13
Family history of CAD[21,23,40,49,51,54,58]	7	8 717	37 (26-47)	64 (58-71)	1.0 (0.9-1.2)	54	0.99 (0.91-1.1)	65	13	13
Obesity[21,41,60]	3	4887	40 (26-55)	68 (48-84)	1.0 (0.9-1.2)	45	0.99 (0.88-1.1)	44	13	13
Prior CABG[23,31,58,70]	4	5902	9.1 (6-14)	91 (87-94)	0.97 (0.5-2.1)	77	1.00 (0.92-1.1)	77	13	13

Abbreviations: CABG, coronary artery bypass graft; CAD, coronary artery disease; LR+, positive likelihood ratio; LR−, negative likelihood ratio; NPV, negative predictive value; PPV, positive predictive value.

[d] References 21, 23, 37, 49, 54, 58, 60, 70.

[e] References 21, 23, 31, 40, 49, 51, 58, 62, 70.

[f] References 21, 23, 31, 40, 47, 49, 51, 54, 58, 60, 62, 70.

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Valeurs prédictives

- **Valeur prédictive positive**
  - Probabilité d'être malade si le test est positif
  - Probabilité à posteriori ou post test
    - VPP=VP/VP+FP
- **Valeur prédictive négative**
  - Probabilité de ne pas être malade si le test est négatif
  - Probabilité post test
    - VPN=VN/VN+FN
- **Valeur prédictive**
  - *Fonction de la prévalence*

Likelihood ratio (LR)
ou rapport de vraisemblance (RV)

- **RV associé à un test positif (RVP)**
  - Indique dans quelle mesure un test positif augmente la probabilité que le patient est malade
- **RV associé à un test négatif (RVN)**
  - Indique dans quelle mesure un test négatif diminue la probabilité que le patient soit indemne
- **Avantages**
  - Pas affecté par la prévalence de la maladie
  - Permet de calculer la probabilité post test de la maladie
  - Permet de calculer le gain diagnostique d'un test

Apport diagnostique d'un test en fonction de la valeur des rapports de vraisemblance positif et négatif

RV positif	RV négatif	Apport diagnostique
>10	<0.1	Très fort
5-10	0.1-0.2	Fort
2-5	0.2-0.5	Modéré
1-2	0.5-1	Faible
1	1	Nul

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Abbreviations: CABG, coronary artery bypass graft; CAD, coronary artery disease; LR+, positive likelihood ratio; LR−, negative likelihood ratio; NPV, negative predictive value; PPV, positive predictive value.

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[e] References 21, 23, 31, 40, 49, 51, 58, 62, 70.

[f] References 21, 23, 31, 40, 47, 49, 51, 54, 58, 60, 62, 70.

Table 2. Performance of Chest Pain Characteristics in Diagnosing Acute Coronary Syndrome[a]

Test	No. Studies	No. Patients	% (95% CI) Sensitivity	% (95% CI) Specificity	LR+ (95% CI)	I^2, %[b]	LR− (95% CI)	I^2, %[b]	%[c] PPV	%[c] NPV
Radiation to both arms[49]	1	2718	11 (8.3-15)	96 (95-96)	2.6 (1.8-3.7)		0.93 (0.89-0.96)		28	12
Pain similar to prior ischemia[49]	1	2718	47 (42-53)	79 (77-80)	2.2 (2.0-2.6)		0.67 (0.60-0.74)		25	9
Change in pattern over prior 24 h[49]	1	2718	27 (23-32)	86 (85-88)	2.0 (1.6-2.5)		0.84 (0.79-0.90)		23	11
"Typical" chest pain[d,47,49,54,60,62,71]	6	14 584	66 (58-74)	66 (49-83)	1.9 (0.94-2.9)	98	0.52 (0.35-0.69)	95	22	7
Worse with exertion[e,49,73]	2	5049	38-53	73-777	1.5-1.8		0.66-0.83		18-21	9-11
Radiation to neck or jaw[37,49,60]	3	4018	24 (15-36)	84 (76-90)	1.5 (1.3-1.8)	0	0.91 (0.87-0.95)	7.2	18	12
Recent episode of similar pain[73]	1	2331	55 (50-60)	56 (54-59)	1.3 (1.1-1.4)		0.80 (0.71-0.90)		16	11
Radiation to left arm[37,47,49]	3	13 613	40 (28-54)	69 (61-76)	1.3 (1.2-1.4)	0	0.88 (0.81-0.96)	69	16	12
Radiation to right arm[49]	1	2718	5.4 (3.4-8.3)	96 (95-97)	1.3 (0.78-2.1)		0.99 (0.96-1.0)		16	13
Associated diaphoresis[e,49,60]	2	3249	24-28	79-82	1.3-1.4		0.91-0.93		16-17	12-12
Associated dyspnea[49,60,62]	3	3648	45 (42-49)	61 (59-63)	1.2 (1.1-1.3)	0	0.89 (0.82-0.96)	0	15	12
Abrupt onset[49]	1	2718	76 (71-80)	32 (30-34)	1.1 (1.0-1.2)		0.75 (0.61-0.91)		14	10
Any improvement with nitroglycerin[40,66,73]	3	3218	71 (23-95)	35 (44-86)	1.1 (0.93-1.3)	86	0.90 (0.85-0.96)	0	14	12
"Typical" radiation[e,f,54,62]	2	560	25-32	69-96	1.0-5.7		0.78-0.98		13-46	10-13
Burning pain[e,49,60]	2	3249	12-16	84-92	1.0-1.4		0.97-1.0		13-17	13-13
Associated nausea/vomiting[e,49,60]	2	3249	21-22	77-80	0.92-1.1		0.98-1.0		12-14	13-13
Associated palpitations[60]	1	3487	6.0 (3.5-10)	91 (88-94)	0.71 (0.37-1.3)		1.0 (0.98-1.1)		10	13
Associated syncope[73]	1	2331	9.0 (6.4-12)	84 (82-85)	0.55 (0.39-0.76)		1.1 (1.1-1.1)		8	14
Pleuritic pain[e,37,49]	2	3487	18-36	78-93	0.35-0.61		1.1-1.2		6.6-8.4	14-15

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Does This Patient With Chest Pain Have Acute Coronary Syndrome? The Rational Clinical Examination Systematic Review

Risk factors. Family history of CAD, history of tobacco use, and obesity were not strong predictors of an ACS diagnosis (**Table 1**). Findings suggesting ACS (LR+≥2.0 and CI that excluded 1.0) were history of abnormal prior stress test (specificity, 96%; LR, 3.1 [95% CI, 2.0-4.7]) and peripheral arterial disease (specificity, 97%; LR, 2.7 [95% CI, 1.5-4.8]). For identifying patients less likely to have ACS, no risk factor when absent conferred an LR of 0.5 or lower.

Symptoms. Findings with an LR+ of 2.0 or higher and a CI that excluded 1.0 (**Table 2**) were pain radiation to both arms (specificity, 96%; LR, 2.6 [95% CI, 1.8-3.7]), pain similar to prior ischemia (specificity, 79%; LR, 2.2 [95% CI, 2.0-2.6]), and change in pain pattern over the prior 24 hours (specificity, 86%; LR, 2.0 [95% CI, 1.6-2.4]). Response to nitroglycerin was unhelpful; both improvement and lack of improvement had LRs approaching 1.0. Pleuritic pain had an LR range of 0.35 to 0.61.

Table 3. Performance of Physical Examination Elements in Diagnosing Acute Coronary Syndrome[a]

	No.		% (95% CI)				%[b]	
Test	Studies	Patients	Sensitivity	Specificity	LR+ (95% CI)	LR− (95% CI)	PPV	NPV
Hypotension (SBP<100)[31]	1	634	3.1 (1.2-7.9)	99 (98-100)	3.9 (0.98-15)	0.98 (0.95-1.0)	37	13
Lung rales[31]	1	634	9.2 (5.3-16)	95 (93-97)	2.0 (1.0-4.0)	0.95 (0.90-1.0)	23	12
Tachypnea[31]	1	634	10 (5.9-16)	95 (92-96)	1.9 (0.99-3.5)	0.95 (0.89-1.0)	22	12
Tachycardia (heart rate>120)[31]	1	619	3.2 (0.86-7.9)	98 (96-99)	1.3 (0.42-3.94)	0.99 (0.96-1.0)	16	13
Pain reproduced on palpation[37]	1	839	5.5 (2.5-10)	80 (77-84)	0.28 (0.14-0.54)	1.2 (1.0-1.2)	4.0	15

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The Rational Clinical Examination Systematic Review

We found that the accuracy of risk factors and symptoms was generally poor, and that any individual element was unlikely to be helpful in making an ACS diagnosis. Moreover, even those risk factors and symptoms that performed better tended to be more specific than sensitive, and most parameters had poor sensitivity. Overall clinical impression, incorporating all elements of the history and physical examination performed better, but the best diagnostic tests were clinical prediction tools

2014 AHA/ACC Guideline for the Management of Patients With Non-ST-Elevation Acute Coronary Syndromes

Recommendations	COR	LOE
Perform rapid determination of likelihood of ACS, including a 12-lead ECG within 10 min of arrival at an emergency facility, in patients whose symptoms suggest ACS	I	C
Perform serial ECGs at 15- to 30-min intervals during the first hour in symptomatic patients with initial nondiagnostic ECG	I	C
Measure cardiac troponin (cTnI or cTnT) in all patients with symptoms consistent with ACS*	I	A
Measure serial cardiac troponin I or T at presentation and 3–6 h after symptom onset* in all patients with symptoms consistent with ACS	I	A
Use risk scores to assess prognosis in patients with NSTE-ACS	I	A
Risk-stratification models can be useful in management	IIa	B
Obtain supplemental electrocardiographic leads V_7 to V_9 in patients with initial nondiagnostic ECG at intermediate/high risk for ACS	IIa	B
Continuous monitoring with 12-lead ECG may be a reasonable alternative with initial nondiagnostic ECG in patients at intermediate/high risk for ACS	IIb	B

Risk assessment scores and clinical prediction algorithms using clinical history, physical examination, ECG, and cardiac troponins have been developed to help identify patients with ACS at increased risk of adverse outcome(s). Common risk assessment tools include the TIMI (Thrombolysis In Myocardial Infarction) risk score (42), the PURSUIT (Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrilin Therapy) risk score (43), the GRACE (Global Registry of Acute Coronary Events) risk score (44), and the NCDR-ACTION (National Cardiovascular Data Registry-Acute Coronary Treatment and Intervention

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4.2 Ischaemic risk assessment

In NSTE-ACS, quantitative assessment of ischaemic risk by means of scores is superior to the clinical assessment alone.

score provides the most accurate stratification of risk both on admission and at discharge.[92,93]

GRACE™
GLOBAL REGISTRY OF ACUTE CORONARY EVENTS

)Age (years	
40>	0
49–40	18
59–50	36
69–60	55
79–70	73
80≤	91

)Heart rate (bpm	
70>	0
89–70	7
109–90	13
149–110	23
199–150	36
200<	46

)Systolic BP (mmHg	
80>	63
99–80	58
119–100	47
139–120	37
159–140	26
199–160	11
200<	0

Killip class	
Class I	0
Class II	21
Class III	43
Class IV	64

Creatinine (mg/dL)	
0.0- 0.39	2
0.4–0.79	5
0.8–1.19	8
1.2–1.59	11
1.6–1.99	14
0.2–3.99	23
>4	31

Cardiac arrest at admission	43
Elevated cardiac markers	15
ST-segment deviation	30

Eur Heart J 2005; 26 (9):865-872.

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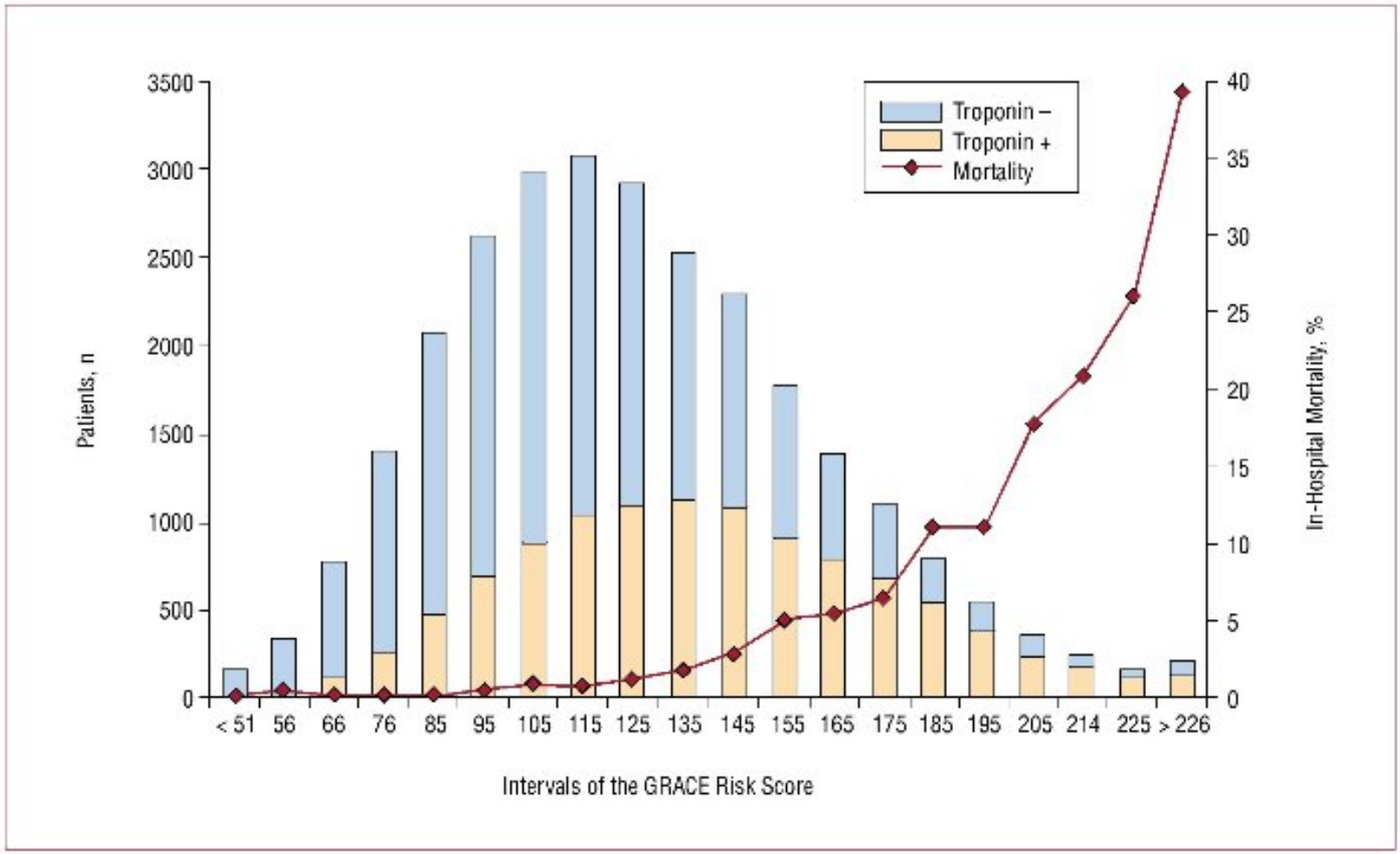
4.2 Ischaemic risk assessment

In NST

scores

score

missio



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GRACE™
GLOBAL REGISTRY OF ACUTE CORONARY EVENTS

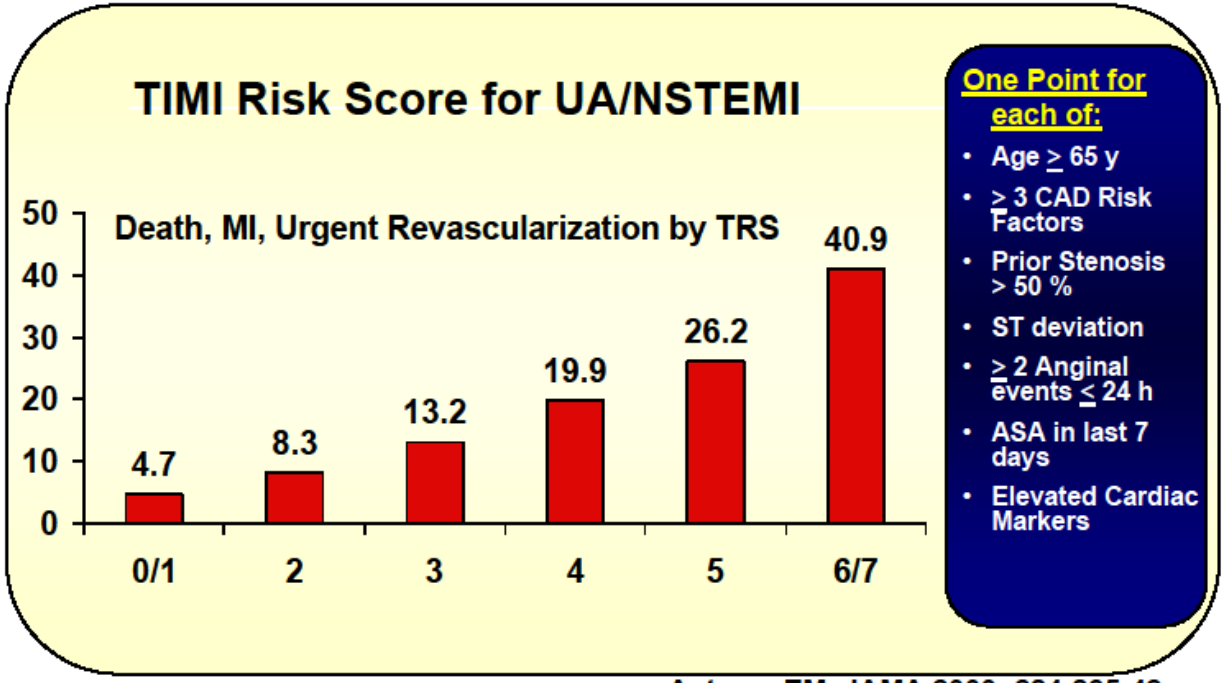
Risk assessment by GRACE score:

We can assess risk by summation of score for all eight parameters.

Total score	Risk assessment
≤ 100	Low risk patients– In-hospital death rate less than 1%
101-170	Medium risk patients – In-hospital death rate 1-9%
≥ 171	High risk patients – In-hospital death rate more than 9%

TIMI UA/NSTEMI RISK SCORE

1) Age ≥65	1 point
2) ≥3 risk factors for CAD	1 point
3) Use of ASA (last 7 days)	1 point
4) Known CAD (prior stenosis ≥50%)	1 point
5) >1 episode rest angina in <24 h	1 point
6) ST-segment deviation	1 point
7) Elevated cardiac markers	1 point



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West J Emerg Med. 2017 Apr;18(3):474-478. doi: 10.5811/westjem.2016.12.32676. Epub 2017 Feb 27.

The Fast and the Furious: Low-Risk Chest Pain and the Rapid Rule-Out Protocol.

Huis In 't Veld MA[1], Cullen L[2], Mahler SA[3], Backus BE[4], Dezman ZDW[5], Mattu A[5].

However, neither TIMI nor GRACE was designed for ED chest pain risk stratification. The TIMI score was designed to be applied to patients with unstable angina or non ST-elevation myocardial infection (NSTEMI) to determine their risk for 14-day mortality, new or recurrent acute myocardial infarct (AMI) or severe recurrent ischemia requiring urgent revascularization.[3] The GRACE score was developed to risk stratify patients with confirmed ACS to estimate their in-hospital, six-month and three-year mortality.[4] While these scores were subsequently validated in an ED setting, they lack the sensitivity needed to identify a low-risk population capable of safe early discharge from the ED.[5]

JAMA. 2015;314(18):1955-1965. doi:10.1001/jama.2015.12735

Does This Patient With Chest Pain Have Acute Coronary Syndrome? The Rational Clinical Examination Systematic Review

Table 5. Performance of Clinical Decision Tools in Diagnosing Acute Coronary Syndrome[a]

Risk Level	Threshold	LR (95% CI)[b]	% I^2	Predictive Value[c]
High				
HEART score[18,20,21,23]	7-10	13 (7.0-24)	89	66
TIMI score[d]	5-7	6.8 (5.2-8.9)	56	50
Low				
HEART score[18,20,21,23]	0-3	0.20 (0.13-0.30)	78	2.9
TIMI score[d]	0-1	0.31 (0.23-0.43)	96	4.4

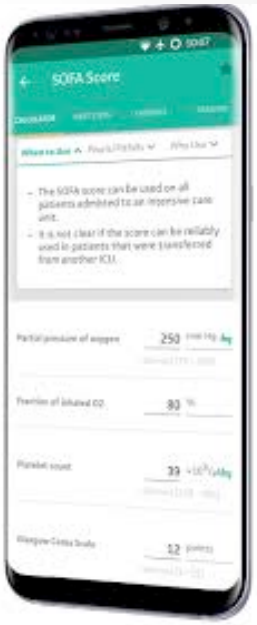
Because the ECG can exclude STEMI, the key distinction that must be made in the majority of patients is differentiating between acute coronary syndrome and noncardiac chest pain.

Neth Heart J. 2008 Jun;16(6):191-6.

Chest pain in the emergency room: value of the HEART score.

Six AJ[1], Backus BE, Kelder JC.

History (Anamnesis)	Highly suspicious	2
	Moderately suspicious	1
	Slightly suspicious	0
ECG	Significant ST-deviation	2
	Non-specific repolarisation disturbance / LBBB / PM	1
	Normal	0
Age	≥ 65 years	2
	45 – 65 years	1
	≤ 45 years	0
Risk factors	≥ 3 risk factors *or* history of atherosclerotic disease	2
	1 or 2 risk factors	1
	No risk factors known	0
Troponin	≥ 3x normal limit	2
	1-3x normal limit	1
	≤ normal limit	0




The Devil
is in the
Details

Neth Heart J. 2008 Jun;16(6):191-6.

Chest pain in the emergency room: value of the HEART score.

Six AJ[1], Backus BE, Kelder JC.

mainly suspicious elements, such as middle- or left-sided, heavy chest pain, radiation, and/or relief of symptoms by sublingual nitrates,

History (Anamnesis)	Highly suspicious	2
	Moderately suspicious	1
	Slightly suspicious	0
ECG	Significant ST-deviation	2
	Non-specific repolarisation disturbance / LBBB / PM	1
	Normal	0
Age	≥ 65 years	2
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	No risk factors known	0
Troponin	≥ 3x normal limit	2
	1-3x normal limit	1
	≤ normal limit	0

both nonspecific and suspicious elements,

absence of specific elements

SCA = processus dynamique
--> répéter les ECG, comparer à ECG de réf.

Risk factors

Hypercholesterolemia
Hypertension
Diabetes Mellitus
Cigarette smoking
Positive family history
Obesity (BMI>30)

Pas de point de FRCV si pas de suivi médical ?..
--> prendre en compte HTA et hyperG à l'admission, et se méfier si pas de suivi médical…

[b] Atherosclerotic disease: history of coronary revascularization, myocardial infarction, stroke, and peripheral vascular disease.

Neth Heart J. 2008 Jun;16(6):191-6.

Chest pain in the emergency room: value of the HEART score.

Six AJ[1], Backus BE, Kelder JC.

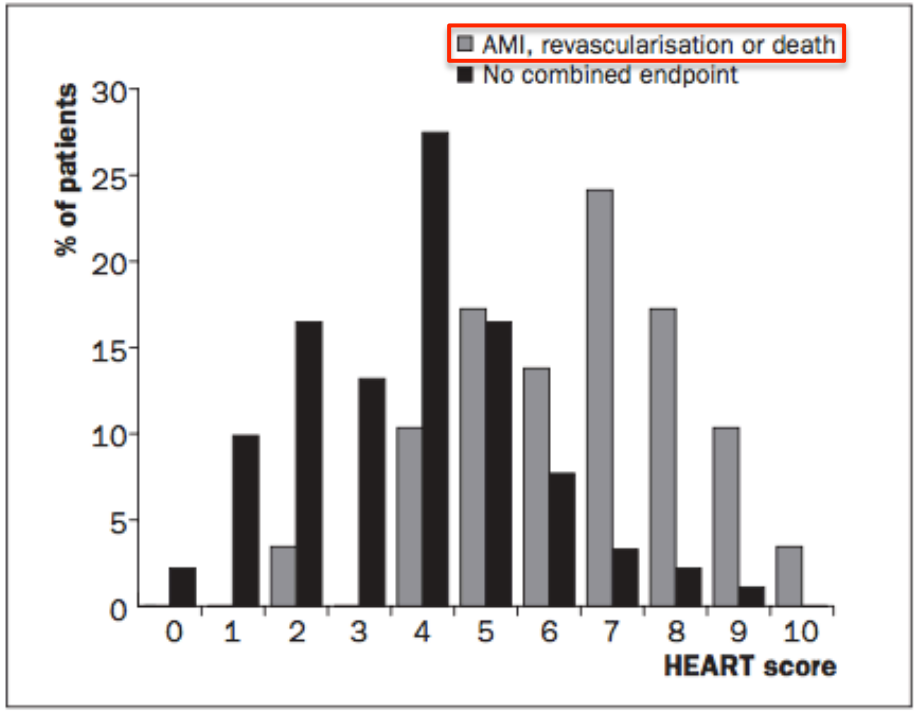

Figure 2. Percentages of patients in each HEART score in groups with and without the combined endpoint of AMI, revascularisation or death.

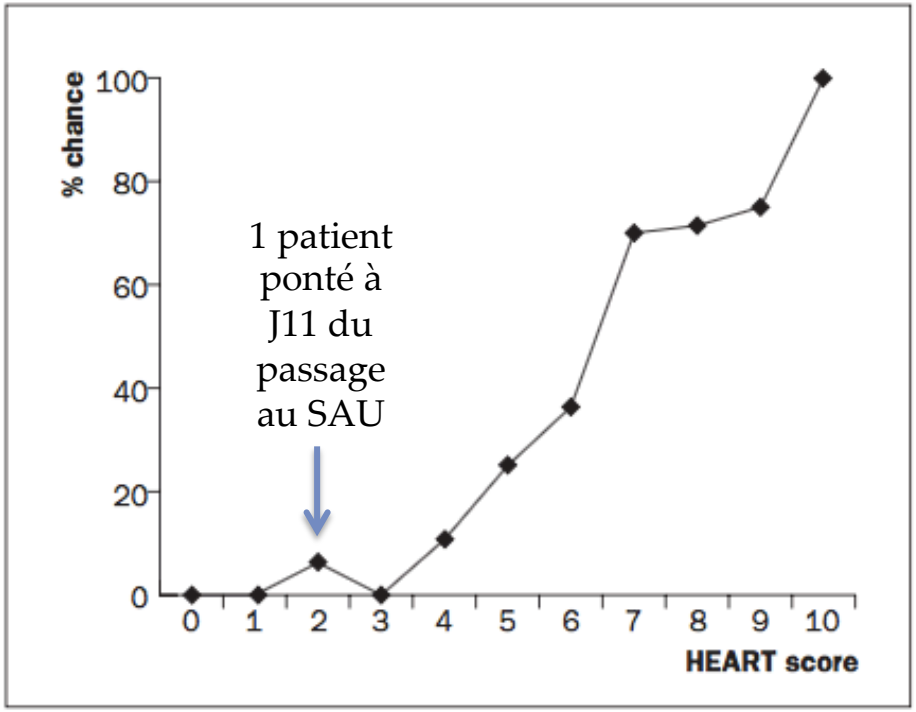

Figure 3. Chances of reaching the combined endpoint in each HEART category.

Cent vingt patients inclus, suivis sur 1 an

HEART 0 à 3 -> 1/39 patients = 2,5% de MACE
HEART 4 à 6 -> 12 /59 patients = 20% de MACE
HEART 7 à 10 -> 16/22 patients = 72,7% de MACE

…MAIS FAIBLE EFFECTIF ET ETUDE MONOCENTRIQUE RETROSPECTIVE…

Impossible d'afficher l'image. Votre ordinateur manque peut-être de mémoire pour ouvrir l'image ou l'image est endommagée. Redémarrez l'ordinateur, puis ouvrez à nouveau le fichier. Si le x rouge est toujours affiché, vous devrez peut-être supprimer l'image avant de la réinsérer.

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SAU « cardio »
3 CH + 1 CHU en Hollande

palpitations, TdR, dyspnée, autres…

« perdus de vue »

MULTICENTRIQUE MAIS RETROSPECTIF…

Impossible d'afficher l'image. Votre ordinateur manque peut-être de mémoire pour ouvrir l'image ou l'image est endommagée. Redémarrez l'ordinateur, puis ouvrez à nouveau le fichier. Si le x rouge est toujours affiché, vous devrez peut-être supprimer l'image avant de la réinsérer.

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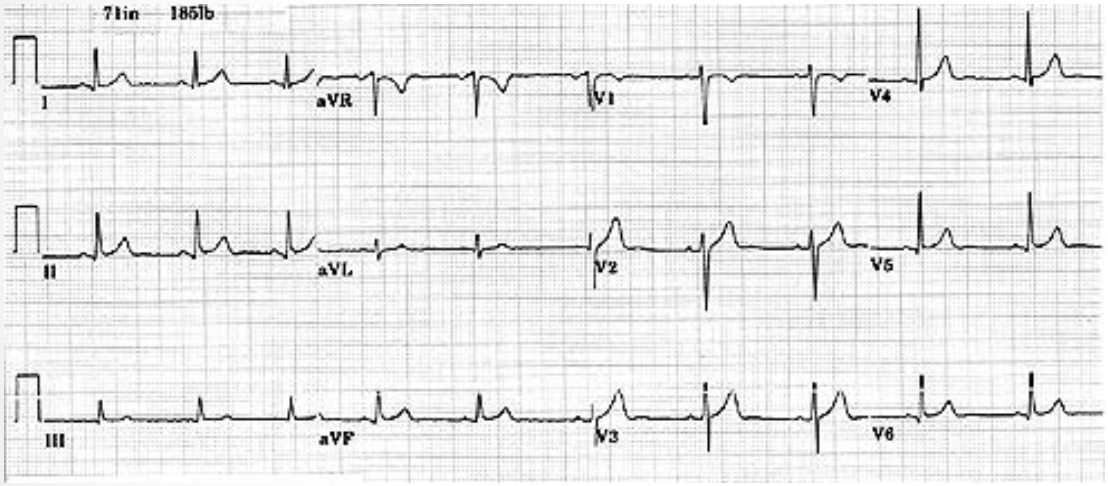
F42, sans ATCD ni FRCV, stressée par son travail

Douleur thoracique rétrosternale, début il y a 1 heure

Douleur comme « un poids », « ça serre ». TA=13/8, FC=65, 99%AA

Moins douloureuse après l'arrivée au SAU, test TNT +/- positif

ECG :



Première tropo : < 17 ng/l

History (Anamnesis)	Highly suspicious	2
	Moderately suspicious	1
	Slightly suspicious	0
ECG	Significant ST-deviation	2
	Non-specific repolarisation disturbance / LBBB / PM	1
	Normal	0
Age	≥ 65 years	2
	45 – 65 years	1
	≤ 45 years	0
Risk factors	≥ 3 risk factors *or* history of atherosclerotic disease	2
	1 or 2 risk factors	1
	No risk factors known	0
Troponin	≥ 3x normal limit	2
	1-3x normal limit	1
	≤ normal limit	0

→ *score HEART = 2*

- **~~SCA~~ ou pas ? ~~Hospi~~ ou pas ? 2ème tropo ? ~~3ème tropo~~ ?**

Une douleur thoracique

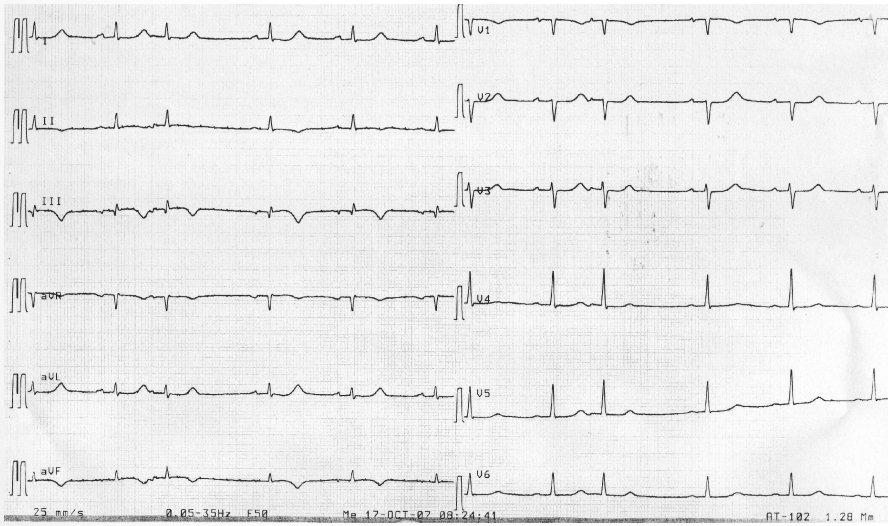
H74, ATCD d'IdM il y a 3 ans, diabétique de type 2

Brûlures épigastriques intermittentes depuis 3 j

ECG :

(pas de modif / ECG de réf.)

TA=14/7, FC=58, 98%AA



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	1 or 2 risk factors	1
	No risk factors known	0
Troponin	≥ 3x normal limit	2
	1-3x normal limit	1
	≤ normal limit	0

Première tropo : 35 ng/l

→ score HEART = 6

- **SCA ~~ou pas~~ ? Hospi ~~ou pas~~ ? 2ème tropo ? ~~3ème tropo ?~~**

TIMI RISK Score

GRACE™
GLOBAL REGISTRY OF ACUTE CORONARY EVENTS

qui va gagner ?

HEART ❤️

International Journal of Cardiology

A prospective validation of the HEART score for chest pain patients at the emergency department ☆

Netherlands, 2013

B.E. Backus [a,b,*], A.J. Six [c], J.C. Kelder [d], M.A.R. Bosschaert [d], E.G. Mast [e], A. Mosterd [f], R.F. Veldkamp [g], A.J. Wardeh [h], R. Tio [i], R. Braam [j], S.H.J. Monnink [k], R. van Tooren [e], T.P. Mast [l], F. van den Akker [l], M.J.M. Cramer [a], J.M. Poldervaart [m], A.W. Hoes [m], P.A. Doevendans [a]

Background: The focus of the diagnostic process in chest pain patients at the emergency department is to identify both low and high risk patients for an acute coronary syndrome (ACS). The HEART score was designed to facilitate this process. This study is a prospective validation of the HEART score.

Methods: A total of 2440 unselected patients presented with chest pain at the cardiac emergency department of ten participating hospitals in The Netherlands. The HEART score was assessed as soon as the first lab results and ECG were obtained. Primary endpoint was the occurrence of major adverse cardiac events (MACE) within 6 weeks.

Secondary endpoints were (i) the occurrence of AMI and death, (ii) ACS and (iii) the performance of a coronary angiogram. The performance of the HEART score was compared with the TIMI and GRACE scores.

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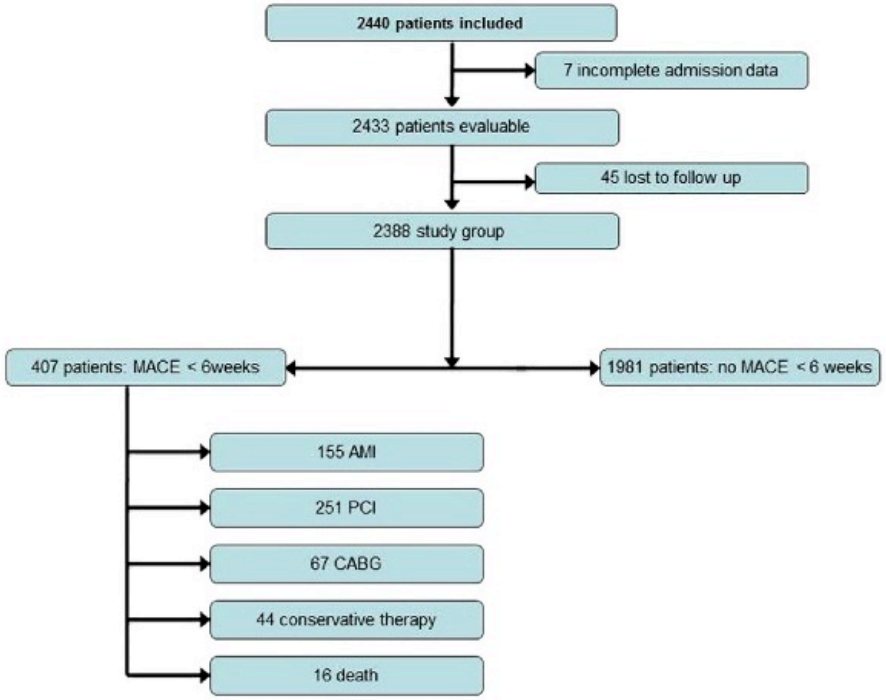

Fig. 1. Patient flow in the HEART score validation study. AMI = acute myocardial infarction. CABG = coronary artery bypass graft. PCI = percutaneous coronary intervention. MACE = major adverse coronary events.

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Table 3
Number of patients in each element of the HEART score.

	No MACE<6w n=1981						MACE<6w n=407						p value for trend
Points	0		1		2		0		1		2		
History	902	(45.5%)	616	(31.1%)	462	(23.3%)	35	(8.6%)	110	(27.0%)	262	(64.4%)	p=0.000
ECG	1323	(66.8%)	380	(19.2%)	278	(14.0%)	147	(36.1%)	86	(21.1%)	174	(42.8%)	p=0.000
Age	376	(19.0%)	862	(43.5%)	743	(37.5%)	15	(3.7%)	171	(42.0%)	221	(54.3%)	p=0.000
Risk Factors	221	(11.2%)	729	(36.8%)	1031	(52.0%)	20	(4.9%)	116	(28.5%)	271	(66.6%)	p=0.000
Troponin	1825	(92.1%)	89	(4.5%)	67	(3.4%)	218	(53.6%)	55	(13.5%)	134	(32.9%)	p=0.000

MACE = Major Adverse Cardiac Events. ECG = electrocardiogram.

Table 4
Average values of the three scores in patients with chest pain presenting at the emergency department in groups with and without MACE.

	Total study population	No MACE<6w n=1981	MACE<6w n=407	C-statistic	p value
HEART	4.4 (2.2)	3.96 (2.0)	6.54 (1.7)	0.83	<0.0001
TIMI	2.5 (1.7)	2.21 (1.6)	3.68 (1.4)	0.75	<0.0001
GRACE	99.9 (36.1)	95.5 (35.0)	121.2 (34.0)	0.70	<0.0001

Averages are given as mean (SD).

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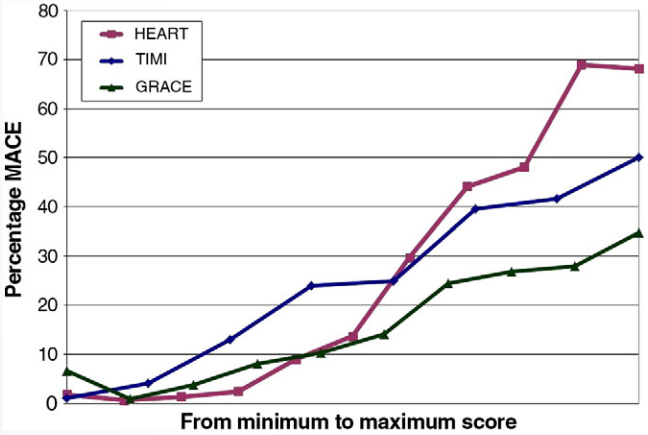
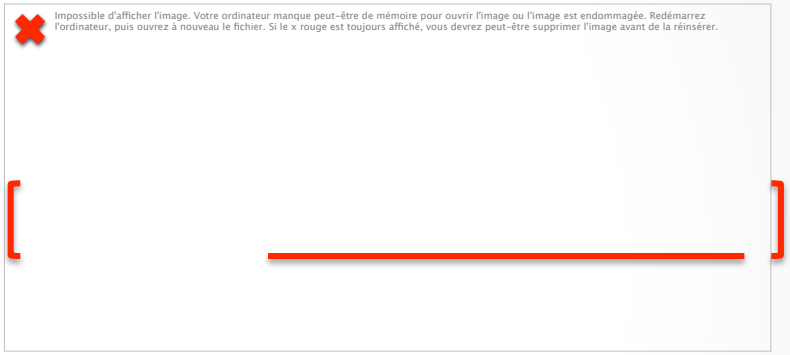


Fig. 3. Probability of reaching a MACE related to the three risk scores. Only for the purpose of comparing graphs we divided the TIMI and GRACE scores in deciles in order to achieve the same distribution as the HEART score on the x-axis. All other computations were made with the original values.



3.7. Predictive values of intermediate scores

The intermediate risk boundaries for all scores were set at a risk of MACE between 5 and 40%.In the group with TIMI scores of 2–5, which accounted for 62.7% of the study population, 350/1497 (23.4%) had a MACE. The 85.7% of the patients who had GRACE scores >60 had MACE in 389/2012 (19.3%) of the cases. The group with an intermediate HEART score (values 4–6) represents 46.1% of the study population. Six-week MACE occurred in 183/1101 (16.6%) of these patients.

3.8. Predictive values of high scores

Only the TIMI and HEART scores reached a high risk level, defined as a risk of MACE>40%. MACE occurred in 34/80 patients (42.5%) where TIMI scores were 6–7. The group with a high HEART score (7–10) represents 17.5% of the study population; six-week MACE occurred in 209/417 (50.1%) of those patients.

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In conclusion, the HEART score for chest pain patients at the emergency department provides the clinician with a quick and reliable predictor of outcome shortly after arrival of the patient, without computer-required calculating. Low HEART scores (0–3), occurring in one third of the patients, exclude short-term MACE with >98% certainty. In these patients one might consider reserved policies. In patients with high HEART scores (7–10) the high risk of MACE may indicate more aggressive policies.

International Journal of Cardiology

Comparison of the GRACE, HEART and TIMI score to predict major adverse cardiac events in chest pain patients at the emergency department

Netherlands, 2016

J.M. Poldervaart [a,*,1], M. Langedijk [b,1], B.E. Backus [c,1], I.M.C. Dekker [d,1], A.J. Six [e,1], P.A. Doevendans [f,1], A.W. Hoes [a,1], J.B. Reitsma [a,1]

- **Cohorte prospective, 1748 patients** dans 9 hôpitaux hollandais
- **Outcome:** MACE à 6 semaines
- **Objectif:** Comparer la performance des 3 scores, notamment pour identifier les patients à « low risk »

Impossible d'afficher l'image. Votre ordinateur manque peut-être de mémoire pour ouvrir l'image ou l'image est endommagée. Redémarrez l'ordinateur, puis ouvrez à nouveau le fichier. Si le x rouge est toujours affiché, vous devrez peut-être supprimer l'image avant de la réinsérer.

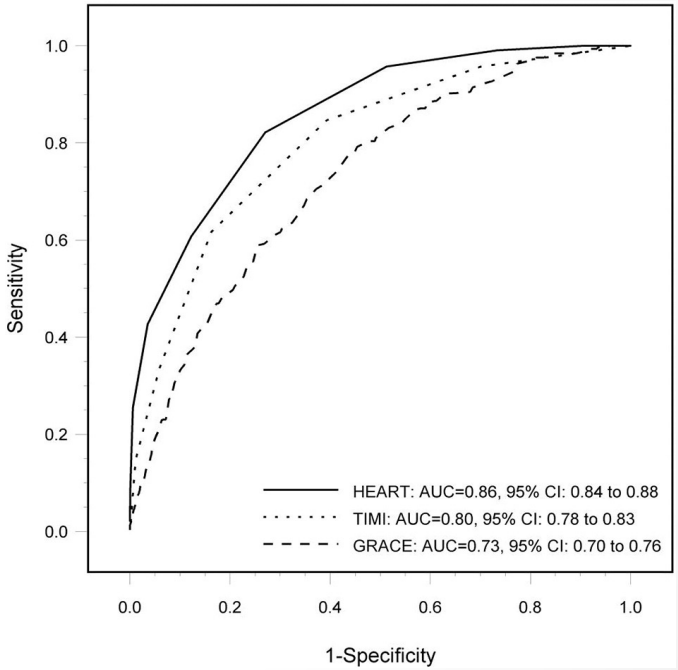

Fig. 2. Receiver-operating-characteristic (ROC) curves and corresponding Areas under the curve (AUCs) of the GRACE, HEART and TIMI score to predict major adverse cardiac events within 6 weeks.

International Journal of Cardiology

Comparison of the GRACE, HEART and TIMI score to predict major adverse cardiac events in chest pain patients at the emergency department

Netherlands, 2016

J.M. Poldervaart [a,*,1], M. Langedijk [b,1], B.E. Backus [c,1], I.M.C. Dekker [d,1], A.J. Six [e,1], P.A. Doevendans [f,1], A.W. Hoes [a,1], J.B. Reitsma [a,1]

Table 3
Comparison of performance of GRACE score, HEART score and TIMI score in terms of safety and efficiency.

Scenario 1: at least 95% sensitivity	GRACE score	HEART score	TIMI score
Corresponding cut-off for "low risk"	≤72 points	≤3 points	0 points
Number of patients classified "low risk" / total number of patients	334/1748 (19.1%)	708/1748 (40.5%)	439/1748 (25.1%)
Percentage of MACE in "low risk" group	3.6% (12/334)	2.0% (14/708)	3.2% (14/439)
MACE, of which AMI	5	3	0
MACE, of which death	0	1	0
Negative predictive value (NPV)	96% (94%–98%)	98% (97–99%)	97% (95–98%)

Scenario 2: at least 98% sensitivity	GRACE score	HEART score	TIMI score
Corresponding cut-off for "low risk"	≤66 points	≤2 points	–*
Number of patients classified "low risk" / total number of patients	231/1748 (13.2%)	381/1748 (21.8%)	–
Percentage of MACE in "low risk" group	2.2% (5/231)	0.8% (3/381)	–
MACE, of which AMI	1	1	–
MACE, of which death	0	0	–
Negative predictive value (NPV)	98% (95–99%)	99% (98–100%)	–

From our head-to-head comparison of the GRACE, HEART and TIMI score in a large prospective cohort of chest pain patients presenting to the ED, we conclude that the HEART score performed best in discriminating between those with and without MACE. The HEART score identified the largest number of patients (40.5%) as low risk without compromising safety. We recommend the use of the HEART score in the work-up of patients with chest pain at the ED.

Comparison of the HEART and TIMI Risk Scores for Suspected Acute Coronary Syndrome in the Emergency Department

Benjamin C. Sun, MD, MPP, Amber Laurie, MS,* Rongwei Fu, PhD,* Maros Ferencik, MD, PhD,† Michael Shapiro, MD,† Christopher J. Lindsell, PhD,‡ Deborah Diercks, MD,§ James W. Hoekstra, MD,¶ Judd E. Hollander, MD,‖ J. Douglas Kirk, MD,** W. Frank Peacock, MD,†† Venkataraman Anantharaman, MD,‡‡ and Charles V. Pollack, Jr, MA, MD‖*

USA, 2016

- **Etude rétrospective, 8255 patients** dans 9 hôpitaux américains
- **Outcome:** MACE à 30 jours
- **Objectif:** comparer scores de HEART et TIMI

We demonstrate that overall discrimination (*c* statistic) was higher for HEART than for TIMI, which is consistent with prior reports by the HEART study team.[2,5] We provide novel data about clinically relevant measures of test performance. We found that the HEART score had better reclassification than the TIMI score. Using reported binary "low-risk" categories, HEART demonstrated similar or superior predictive values and likelihood ratios compared with the TIMI score. Our results are robust to different assumptions about missing data and composite outcomes.

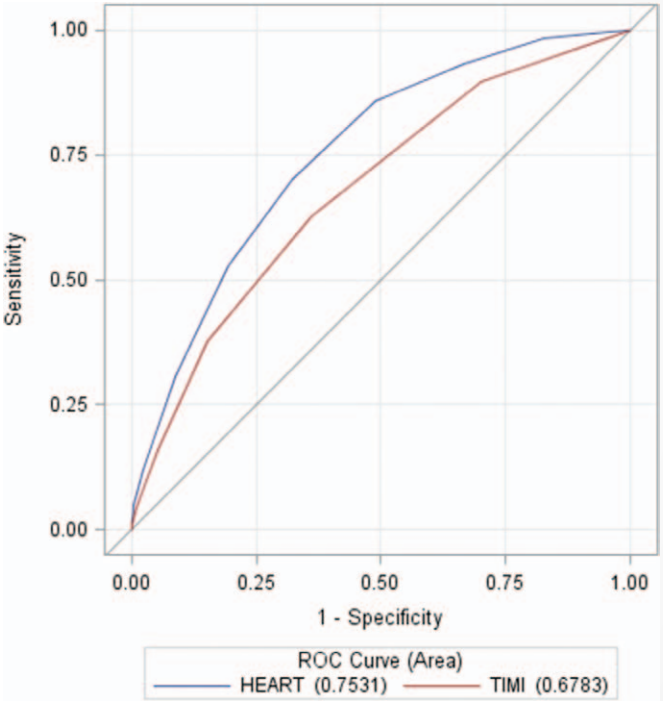

FIGURE 2. Receiver operating characteristic curves for TIMI and HEART.

MACE = 1,8%

Paper	Pts	HEART Score ≤3	MACE in HEART ≤3 (n)	MACE in HEART ≤3 (%)
Six 2008	120	39	1	2.6%
Backus 2010	880	303	3	0.9%
Mahler 2011	1070	904	5	0.6%
Backus 2013	2388	870	15	1.7%
Mahler 2013	991	200	2	1%
Melki 2013	410	247	1	0.4%
Six 2013	2906	820	14	1.7%
Visser 2014	255	85	5	5.9%
Leite 2015	174	98	2	2%
Mahler 2015	141	66	0	0%
Sun 2016	8255	4039	72	1.8%
TOTAL	17,590	7,671	120	1.6%

43.6% low risk group with 1.6% MACE risk

The HEART Pathway Randomized Trial:

Identifying Emergency Department Patients With Acute Chest Pain for Early Discharge

USA, 2015

Simon A. Mahler, MD, MS, **Robert F. Riley, MD**, **Brian C. Hiestand, MD, MPH**, **Gregory B. Russell, MS**, **James W. Hoekstra, MD**, **Cedric W. Lefebvre, MD**, **Bret A. Nicks, MD**, **David M. Cline, MD**, **Kim L. Askew, MD**, **Stephanie B. Elliott, BS**, **David M. Herrington, MD, MHS**, **Gregory L. Burke, MD**, and **Chadwick D. Miller, MD, MS**

- **Etude prospective**, monocentrique, **282 patients**, randomisée en 2 groupes: **Heart Pathway vs Usual Care**
- **Outcome:** Objective cardiac testing à 30 jours
- **Objectif:** comparer les 2 circuits de PEC

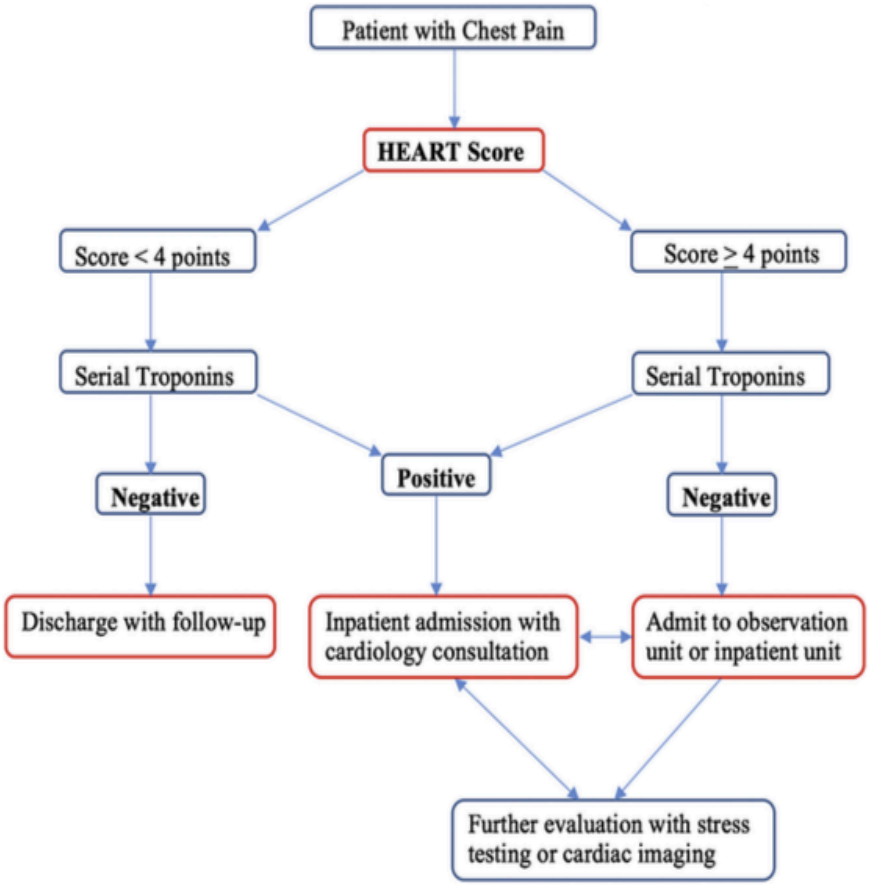

Fig. 1. HEART Pathway [26].

Circ Cardiovasc Qual Outcomes.

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Frequency of HEART Pathway Determinants

Risk stratification Measure	Number, n=141	Percent
HEART score history		
Slightly suspicious (0 points)	52	36.9
Moderately suspicious (1 point)	54	38.3
Highly suspicious (2 points)	35	24.8
Age		
<45 (0 points)	38	27
45–65 (1 point)	80	56.7
>65 (2 points)	23	16.3
ECG		
Normal (0 points)	79	56
Nonspecifc changes (1 point)	60	42.6
Changes consistent with ACS (2 points)	2	1.4
Number of risk factors		
0 (0 points)	16	11.4
1–2 (1 point)	58	41.1
≥3 (2 points)	67	47.5
Troponin (initial)		
Negative (0 points)	133	94.3
1–3× normal limit (1 point)	4	2.8
>3× normal limit (2 points)	4	2.8
Total HEART score		
0	3	2.1
1	9	6.4
2	28	19.9
3	27	19.1
4	31	22
5	21	14.9
≥6	22	15.6
Serial troponin at 3 h		
Negative	131	92.9
Positive	9	6.4
Missing	1	0.7
HEART Pathway		
Low risk (HEART score <3 and negative troponins at 0 and 3 h)	66	46.8
High risk (HEART score >3 or positive troponin at 0 or 3 h)	75	53.2

Circ Cardiovasc Qual Outcomes.

The HEART Pathway Randomized Trial:

Identifying Emergency Department Patients With Acute Chest Pain for Early Discharge

Simon A. Mahler, MD, MS, **Robert F. Riley, MD**, **Brian C. Hiestand, MD, MPH**, **Gregory B. Russell, MS**, **James W. Hoekstra, MD**, **Cedric W. Lefebvre, MD**, **Bret A. Nicks, MD**, **David M. Cline, MD**, **Kim L. Askew, MD**, **Stephanie B. Elliott, BS**, **David M. Herrington, MD, MHS**, **Gregory L. Burke, MD**, and **Chadwick D. Miller, MD, MS**

USA, 2015

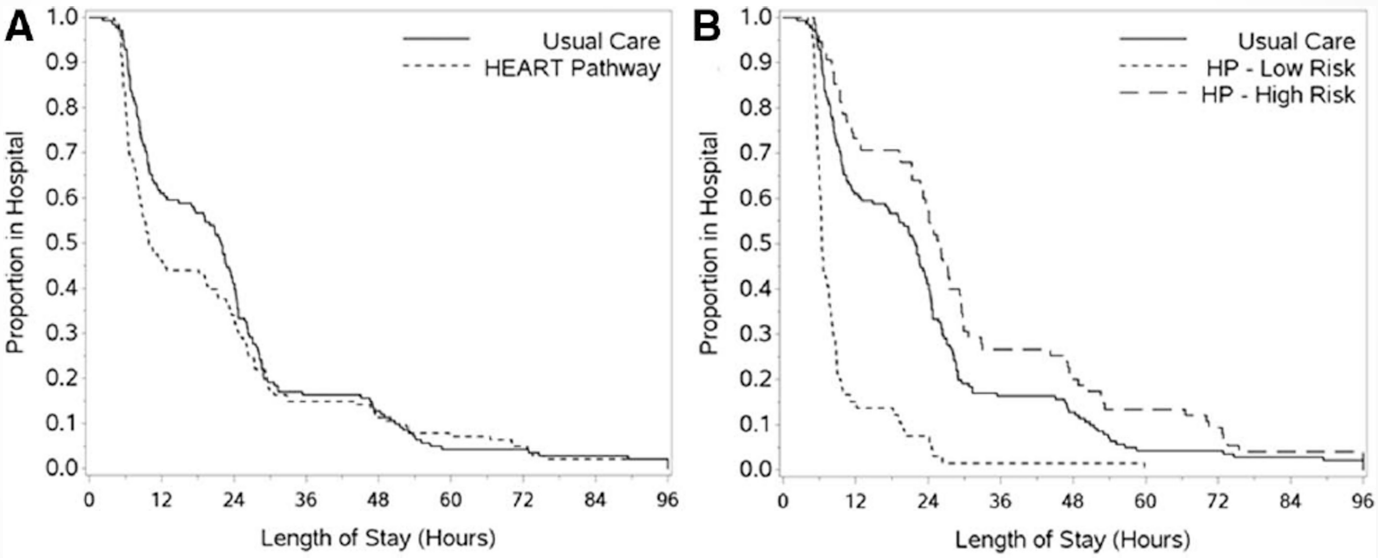

Figure 3.
Kaplan–Meier curves. **A**, Hospital length of stay by randomization arm. **B**, Hospital length of stay for HEART Pathway high- and low-risk groups versus usual care.

Circ Cardiovasc Qual Outcomes.

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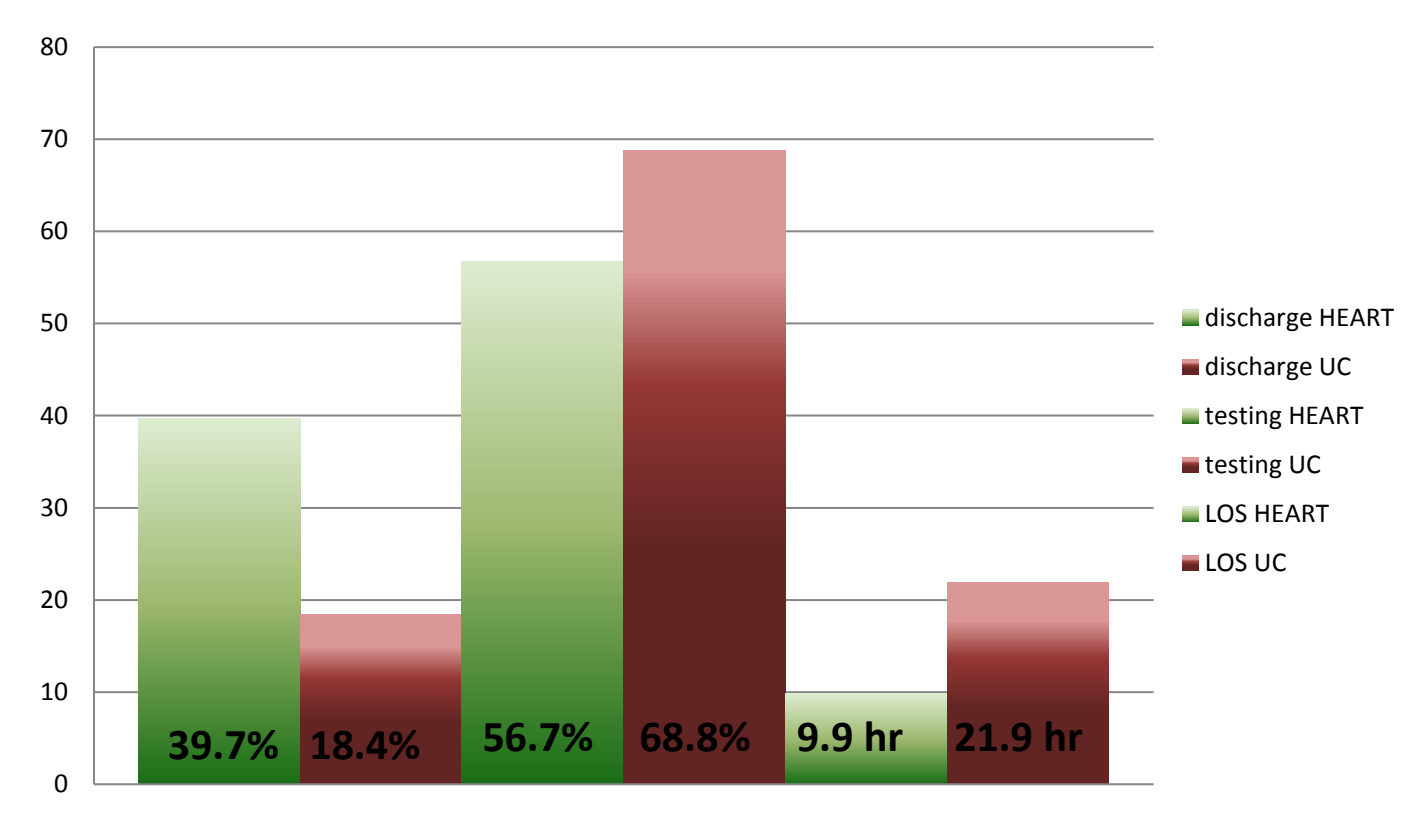

↗de 21,3% ↘de 12,1% ↘ de 12h MACE = 0

Circ Cardiovasc Qual Outcomes.

Increased the early discharge rate by 21% (p=0.0002)

Academic Emergency Medicine
Official Journal of the Society for Academic Emergency Medicine

Adherence to an Accelerated Diagnostic Protocol for Chest Pain: Secondary Analysis of the HEART Pathway Randomized Trial

Simon A. Mahler, MD, MS, Robert F. Riley, MD, Gregory B. Russell, MS, Brian C. Hiestand, MD, MPH, James W. Hoekstra, MD, Cedric W. Lefebvre, MD, Bret A. Nicks, MD, David M. Cline, MD, Kim L. Askew, MD, John Bringolf, MD, Stephanie B. Elliott, David M. Herrington, MD, MHS, Gregory L. Burke, MD, MSc, and Chadwick D. Miller, MD, MS

USA, 2015

Objectives: Accelerated diagnostic protocols (ADPs), such as the HEART Pathway, are gaining popularity in emergency departments (EDs) as tools used to risk stratify patients with acute chest pain. However, provider nonadherence may threaten the safety and effectiveness of ADPs. The objective of this study was to determine the frequency and impact of ADP nonadherence.

Methods: A secondary analysis of participants enrolled in the HEART Pathway RCT was conducted. This trial enrolled 282 adult ED patients with symptoms concerning for acute coronary syndrome without ST-elevation on electrocardiogram. Patients randomized to the HEART Pathway (N = 141) were included in this analysis. Outcomes included index visit disposition, nonadherence, and major adverse cardiac events (MACEs) at 30 days. MACE was defined as death, myocardial infarction, or revascularization. Nonadherence was defined as: 1) undertesting—discharging a high-risk patient from the ED without objective testing (stress testing or coronary angiography) or 2) overtesting—admitting or obtaining objective testing on a low-risk patient.

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USA, 2015

	HEART Pathway		
Adherence	Low-risk	High-risk	Total
Adherent	47 (71)	66 (88)	113 (80)
Nonadherent	19 (29)	9 (12)	28 (20)
Overtesting	19 (29)	0	
Undertesting	0	9 (12)	

Data are reported as *n* (%).
N = 141.
ADP = accelerated diagnostic protocol; HEART = History, Electrocardiogram (ECG), Age, Risk factors, and Troponin.

Results: Nonadherence to the HEART Pathway occurred in 28 of 141 patients (20%, 95% confidence interval [CI] = 14% to 27%). Overtesting occurred in 19 of 141 patients (13.5%, 95% CI = 8% to 19%) and undertesting in nine of 141 patients (6%, 95% CI = 3% to 12%). None of these 28 patients suffered MACE. The net effect of nonadherence was 10 additional admissions among patients identified as low-risk and appropriate for early discharge (absolute decrease in discharge rate of 7%, 95% CI = 3% to 13%).

Annals of Internal Medicine

ORIGINAL RESEARCH

Effect of Using the HEART Score in Patients With Chest Pain in the Emergency Department

A Stepped-Wedge, Cluster Randomized Trial

Netherlands, 2017

Judith M. Poldervaart, MD, PhD; Johannes B. Reitsma, MD, PhD; Barbra E. Backus, MD, PhD; Hendrik Koffijberg, PhD; Rolf F. Veldkamp, MD, PhD; Monique E. ten Haaf, MD; Yolande Appelman, MD, PhD; Herman F.J. Mannaerts, MD, PhD; Jan-Melle van Dantzig, MD, PhD; Madelon van den Heuvel, MD; Mohamed el Farissi, MD; Bernard J.W.M. Rensing, MD, PhD; Nicolette M.S.K.J. Ernst, MD, PhD; Ineke M.C. Dekker, MD; Frank R. den Hartog, MD; Thomas Oosterhof, MD, PhD; Ghizelda R. Lagerweij; Eugene M. Buijs, MD, PhD; Maarten W.J. van Hessen, MD, PhD; Marcel A.J. Landman, MD; Roland R.J. van Kimmenade, MD, PhD; Luc Cozijnsen, MD; Jeroen J.J. Bucx, MD, PhD; Clara E.E. van Ofwegen-Hanekamp, MD, PhD; Maarten-Jan Cramer, MD, PhD; A. Jacob Six, MD, PhD; Pieter A. Doevendans, MD, PhD; and Arno W. Hoes, MD, PhD

- **Etude prospective, randomisée par étapes, 3648 patients** dans 9 hôpitaux hollandais
- **Outcome:** MACE à 6 semaines
- **Objectif:** déterminer si l'utilisation du Heart score diminue la charge de soin, le nb d'hospitalisations et les coûts de santé sans augmenter les MACE

Appendix Figure 2. Stepped-wedge design with the number of patients per hospital included in each study period of the HEART-Impact trial.

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10	Total
Date of switch	07/01/13	08/12/13	09/23/13	11/04/13	12/16/13	01/27/14	03/10/14	04/21/14	06/02/14	07/14/14	
Cluster											
1	39	389									428
2		52	197								249
3			224	343							567
4				215	244						459
5					183	189					372
6						283	130				413
7							324	139			463
8								337	161		498
9									170	29	199
											3648

Usual care

HEART care

Annals of Internal Medicine

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Figure 2. Study protocol for usual care versus HEART care.

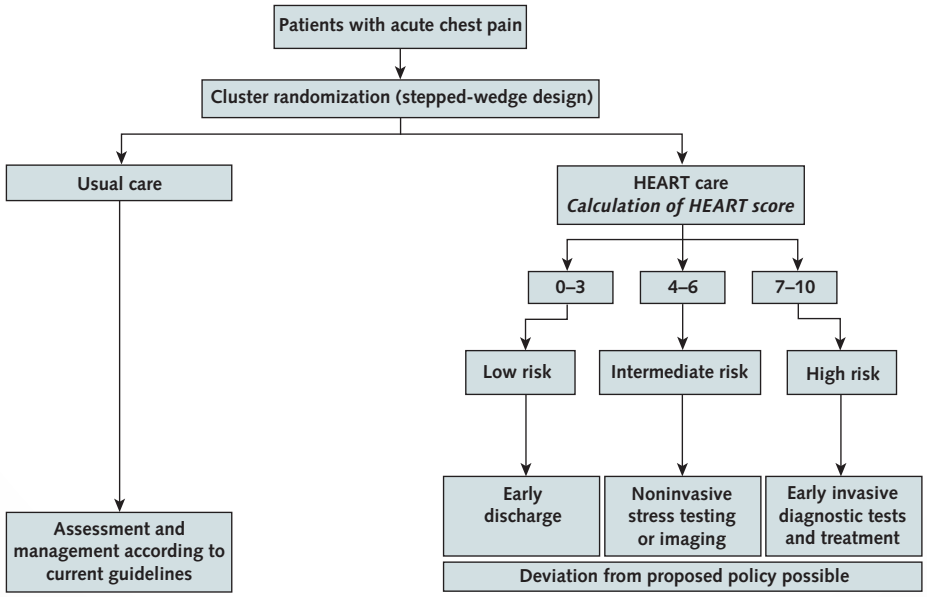

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Table 2. Comparison of 6-Week Incidence of MACE and Its Components Between Usual Care and HEART Care*

Variable	Usual Care (n = 1827)	HEART Care (n = 1821)	HEART Score 0-3 (n = 715)†	HEART Score 4-6 (n = 861)	HEART Score 7-10 (n = 190)	HEART Score Missing (n = 55)
Patients with MACE	405 (22.2)	345 (18.9)	14 (2.0)	175 (20.3)	140 (73.7)	16 (29.1)
MACE components‡						
Death	9 (0.5)	5 (0.3)	1 (0.1)	2 (0.2)	2 (1.1)	0 (0)
Cardiovascular	6	1	0	0	1	0
Noncardiovascular	0	1	0	0	1	0
Unknown cause§	3	3	1	2	0	0
Total cardiac ischemia	400 (21.9)	329 (18.1)	10 (1.4)	162 (18.8)	143 (75.3)	14 (25.4)
Unstable angina	157	105	6	70	25	4
Non-ST-segment elevation myocardial infarction	214	211	4	91	107	9
ST-segment elevation myocardial infarction	29	13	0	1	11	1
Total significant stenosis	290 (15.9)	247 (13.6)	10 (1.4)	117 (13.6)	102 (11.8)	16 (29.1)
Managed conservatively	39	41	1	27	13	0
Percutaneous coronary intervention	208	158	7	70	66	13
Coronary artery bypass grafting	43	48	2	20	23	3
Total MACEs	699	581	21	281	247	30

In this stepped-wedge, cluster randomized trial comparing use of the HEART score versus usual care in patients with chest pain, noninferiority for the safety outcome (MACE) was demonstrated, with a difference in incidence of −1.3% in favor of HEART care and a 1-sided 95% upper confidence limit of 2.1% (within the noninferiority margin of 3.0%). Major adverse cardiac events occurred in 2.0% (CI, 1.2% to 3.3%) of low-risk patients (HEART score of 0 to 3). Use of health care

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Appendix Table 8. Adherence to the HEART Score Recommendation for Further Patient Management*

Variable	Usual Care (*n* = 1827)	HEART Care (*n* = 1766)†		HEART Low-Risk (*n* = 715)‡		HEART High-Risk (*n* = 190)	
		Adhered to HEART Policy (*n* = 1453 [82.3%])	Did Not Adhere to HEART Policy (*n* = 313 [17.7%])	Adhered to HEART Policy (*n* = 424 [59.3%])	Did Not Adhere to HEART Policy (*n* = 291 [40.7%])	Adhered to HEART Policy (*n* = 168 [88%])	Did Not Adhere to HEART Policy (*n* = 22 [12%])
MACE within 6 wk	405 (22.2)	315 (21.7)	14 (4.5)	3 (0.7)	11 (3.8)	137 (82)	3 (14)
MACE (only acute myocardial infarction, emergency revascularization, and death)	243 (13.3)	203 (14.0)	5 (1.6)	0 (0)	5 (1.7)	113 (67)	0 (0)
Discharge ≤4 h after presentation	564 (47)	549 (37.8)	66 (21.1)	359 (84.7)	57 (19.6)	0 (0)	9 (40)
Prolonged observation at ED	635 (53)	438 (30.1)	180 (57.5)	65 (15.3)	167 (57.4)	7 (4)	13 (59)
Initial admission to hospital	628 (34)	466 (32.1)	67 (21.4)	0 (0)	67 (23.7)	161 (100)	0 (0)
Recurrent ED visits within 3 mo	266 (15)	233 (16.0)	36 (11.5)	41 (9.7)	31 (10.7)	41 (24)	5 (23)
Nonelective readmissions within 3 mo	221 (12)	164 (11.3)	26 (8.3)	26 (6.1)	24 (8.2)	35 (21)	2 (9)
Outpatient clinic visits within 3 mo	1093 (60)	1025 (70.5)	207 (66.1)	187 (44.1)	189 (64.9)	144 (86)	18 (82)

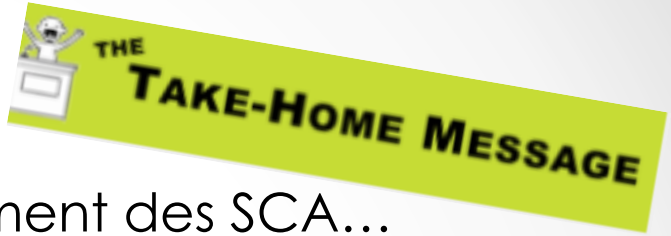
patients (HEART score of 0 to 3). Use of health care resources was typically lower during HEART care, but absolute differences were small, and no statistically significant differences were found after adjustment for clustering and time steps. The combination of equal

score was part of the intervention. In particular, we observed nonadherence of 41% in the low-risk group. A possible explanation for this is the difficulty in changing

behavior. In addition, there may have been concern about the safety of the score. Studies showed rates of misdiagnosis of up to 6% in patients with chest pain, and the estimated incidence of unexpected sudden death is 0.05% to 0.1% (5, 37). Accepting this inevitable risk is becoming more difficult in our increasingly risk-averse society and poses a dilemma for physicians and patients, fueling the need for more testing and monitoring (38).

Le score HEART

NOTES POUR PLUS TARD :



- toutes les douleurs tho ne sont pas forcément des SCA…

- les TIMI et GRACE sont des scores de gravité pour les patients déjà diagnostiqués SCA non STEMI -> peu d'intérêt diagnostic pour nous, plutôt un intérêt pour décider UTS ou SMUR pour NSTEMI..

- le HEART est le seul qui permet de prédire le risque de SCA pour nos patients « tout venant » du SAU avec douleur tho

- intérêt d'intégrer le score HEART pour affiner la filière douleur tho ?

- ex. 1 : HEART < 3 mais tropoUS + à H0 ou modif ECG : pas de RaD !
- ex. 2 : HEART ≤ 2 + ECG nl + tropoUS H0 nle : RaD + cs cardio<72h ?
- ex. 3 : HEART = 3, pas de RàD précoce, tropoUS H0+H3, avis cardio
- ex. 4 : HEART > 3 : tropoUS H0+H3 (+/-H6), avis cardio, probable hospi

STAFF DE DOSSIERS

Merci de votre attention

Vendredi 8 septembre 2017

J. Labiau et F. Lemoël