Impact of use of the HEART score in chest pain patients

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The HEART-score

- Diagnostic risk score for chest pain patients at ED
- 5 clinical elements
- **Supports direct clinical decision**

Risk category	HEART score	Policy
Low	0-3	Discharge
Intermed	4-6	Observation
High	7-10	Invasive

HEART

HEART score for chest pain patients

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	
		Total	

Risk factors for atherosclerotic disease:

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

ORIGINAL ARTICLE

Chest Pain in the Emergency Room

A Multicenter Validation of the HEART Score

Barbra E. Backus, MD, A. Jacob Six, MD, PhD,† Johannes C. Kelder, MD,‡ Thomas P. Mast,§ Frederieke van den Akker,§ E. Gijis Mast, MD,¶ Stefan H. J. Monnink, MD, PhD,‖ Rob M. van Tooren, MD,** and Pieter A. F. M. Doevendans, MD, PhD**

ORIGINAL ARTICLE

Can the HEART Score Safely Reduce Stress Testing and Cardiac Imaging in Patients at Low Risk for Major Adverse Cardiac Events?

Simon A. Mahler, MD,† Brian C. Hiestand, MD, MPH,† David C. Goff, Jr., MD, PhD,* James W. Hoekstra, MD,† and Chadwick D. Miller, MD, MS†*

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

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.L. 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],

ORIGINAL ARTICLE

HEART Score to Further Risk Stratify Patients With Low TIMI Scores

Shannon Marcoon, BA, Anna Marie Chang, MD, Betsy Lee, MD, Rama Salhi, MHS, Judd E. Hollander, MD

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BMC Cardiovascular Disorders

RESEARCH ARTICLE Open Access

Chest pain in the emergency department: risk stratification with Manchester triage system and HEART score

Luís Leite[1*], Rui Baptista[1], Jorge Leitão[2], Joana Cochicho[2], Filipe Breda[2], Luís Elvas[1], Isabel Fonseca[3], Armando Carvalho[2] and José Nascimento Costa[2]

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Identifying patients for early discharge: Performance of decision rules among patients with acute chest pain ☆

ıon A. Mahler [a,*,1], Chadwick D. Miller [a,1], Judd E. Hollander [b,1], John T. Nagurney [c,1], Robert Birkhahn [d,1], ım J. Singer [e,1], Nathan I. Shapiro [f,1], Ted Glynn [g,1], Richard Nowak [h,1], Basmah Safdar [i,1], Mary Peberdy [j,1], ncis L. Counselman [k,1], Abhinav Chandra [l,1], Joshua Kosowsky [m,1], James Neuenschwander [n,1],

Original Article

The HEART Pathway Randomized Trial

Identifying Emergency Department Patients With Acute Chest Pain for Early Discharge

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The HEART Score for the Assessment of Patients With Chest Pain in the Emergency Department

A Multinational Validation Study

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doi 10.1702/1304.14416 *Assist Inferm Ric* 2013;32(2):65-72

€ 20 Acquista articolo

PER VISUALIZZARE IL TESTO COMPLETO EFFETTUARE L'ACCESSO

La valutazione del dolore toracico non traumatico in pronto soccorso: confronto tra heart score e il triage di un ospedale italiano

Assessment of non-traumatic chest pain in emergency room:comparison between heart score and triage assessment of an italian hospital

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HEART Score: A Simple and Useful Tool That May Lower the Proportion of Chest Pain Patients Who Are Admitted

Dina Melki, MD, Tomas Jernberg, MD, PhD

HEART-Impact trial: hypothesis

Fast & accurate risk stratification with HEART score

Improves management & care in chest pain patients

- Fewer admissions and diagnostic procedures in low-risk
- More aggressive in high-risk
- **However, without increasing incidence of cardiac events!**
  - non-inferiority design

Theory ≠ practice??

Methods

Location of inclusion

- ✓ 9 Dutch hospitals
- ✓ July 2013 – August 2014

Inclusion

- ✓ Chest pain
- ✓ Able to give informed consent

Exclusion

- ✓ STEMIs

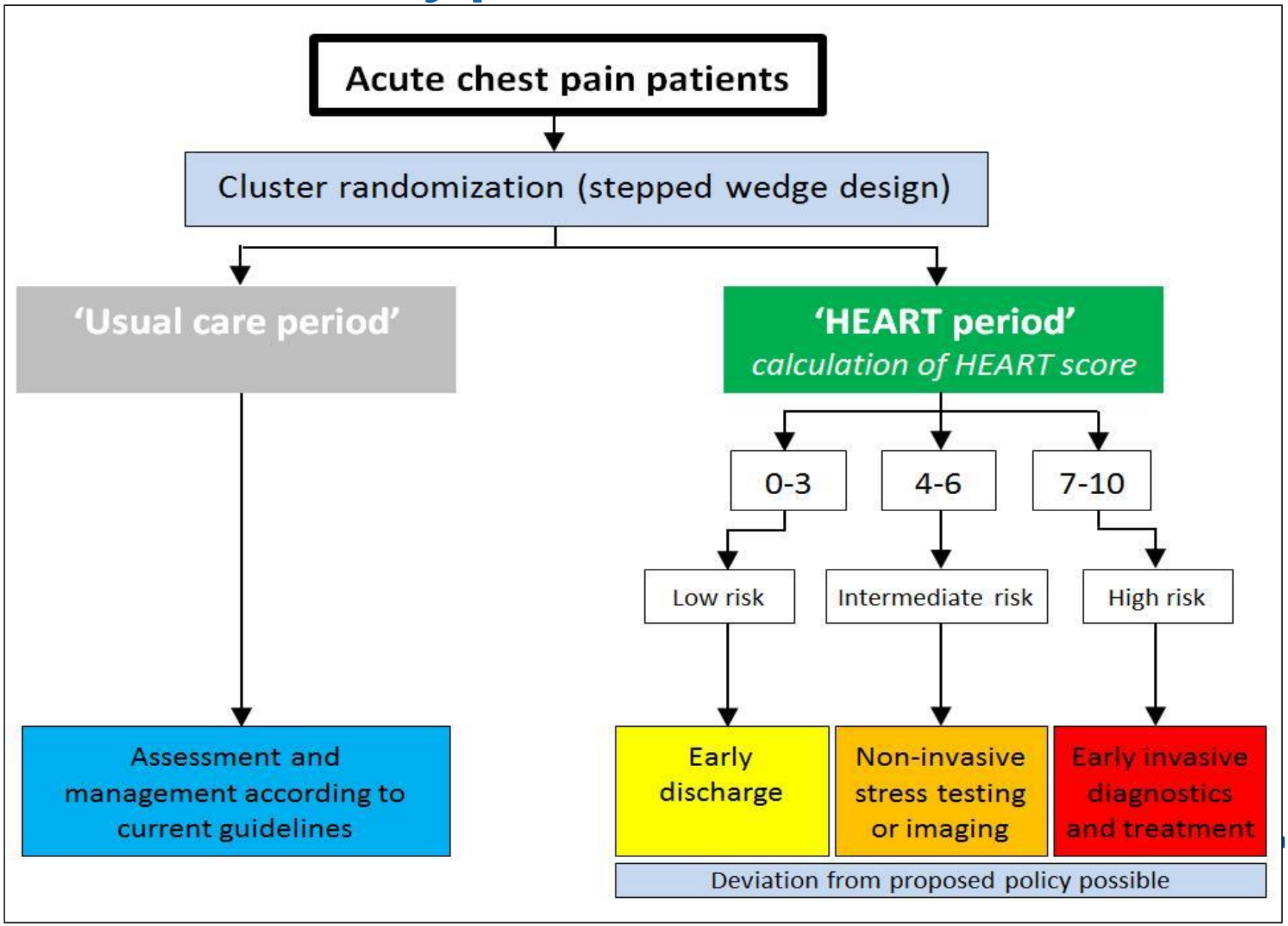
Primary outcome

- ✓ MACE within 6 weeks
  - ✓ unstable angina
  - ✓ NSTEMI
  - ✓ STEMI
  - ✓ CAG – conservatively
  - ✓ PCI
  - ✓ CABG
  - ✓ Death
- ✓ Adjudication committee

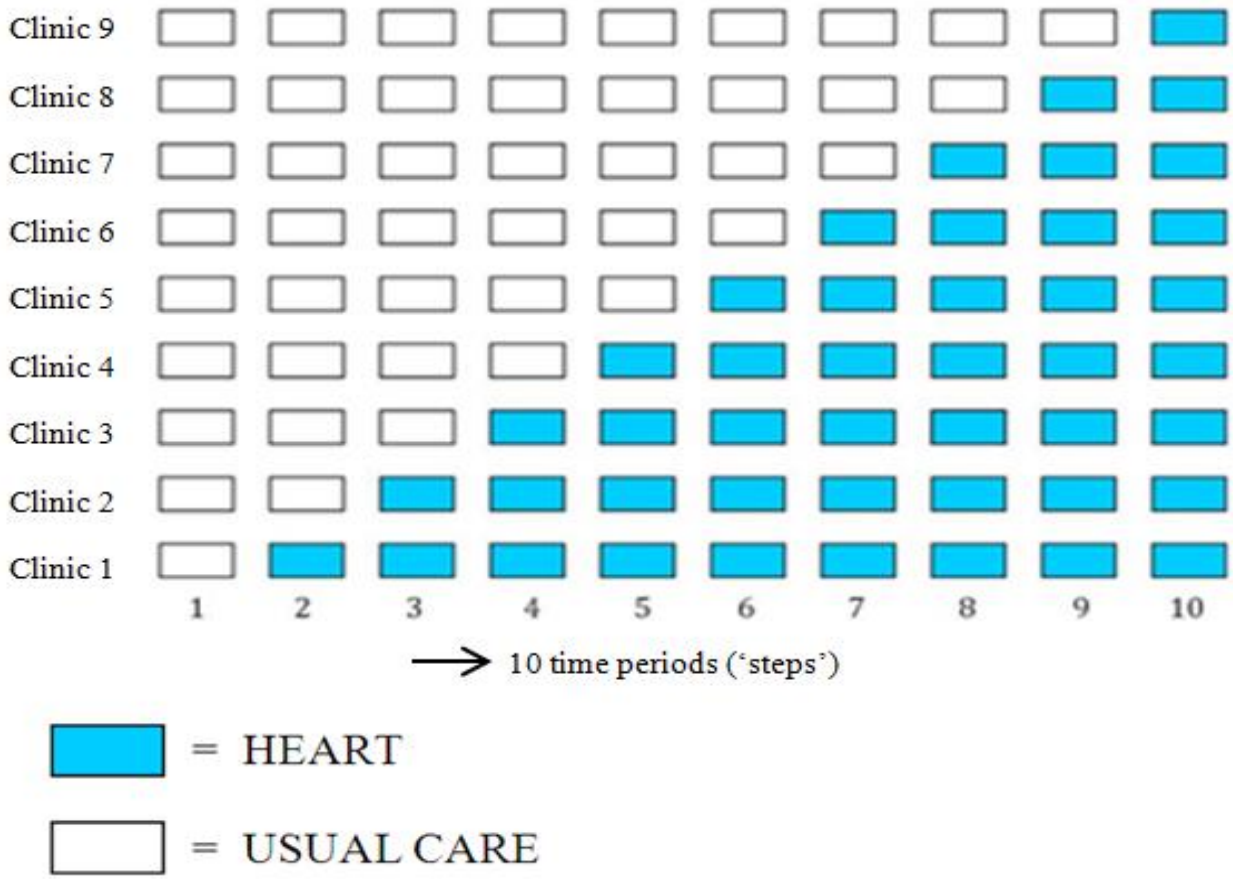
Secondary outcomes

- ✓ Use of health care resources
  - ✓ Recurrent ED visit
  - ✓ (Re)admission
  - ✓ Out-patient clinic visit
  - ✓ GP visit
  - ✓ Diagnostic procedures
- ✓ Quality of life
- ✓ Direct costs
- ✓ Indirect costs
- ✓ Cost-effectiveness

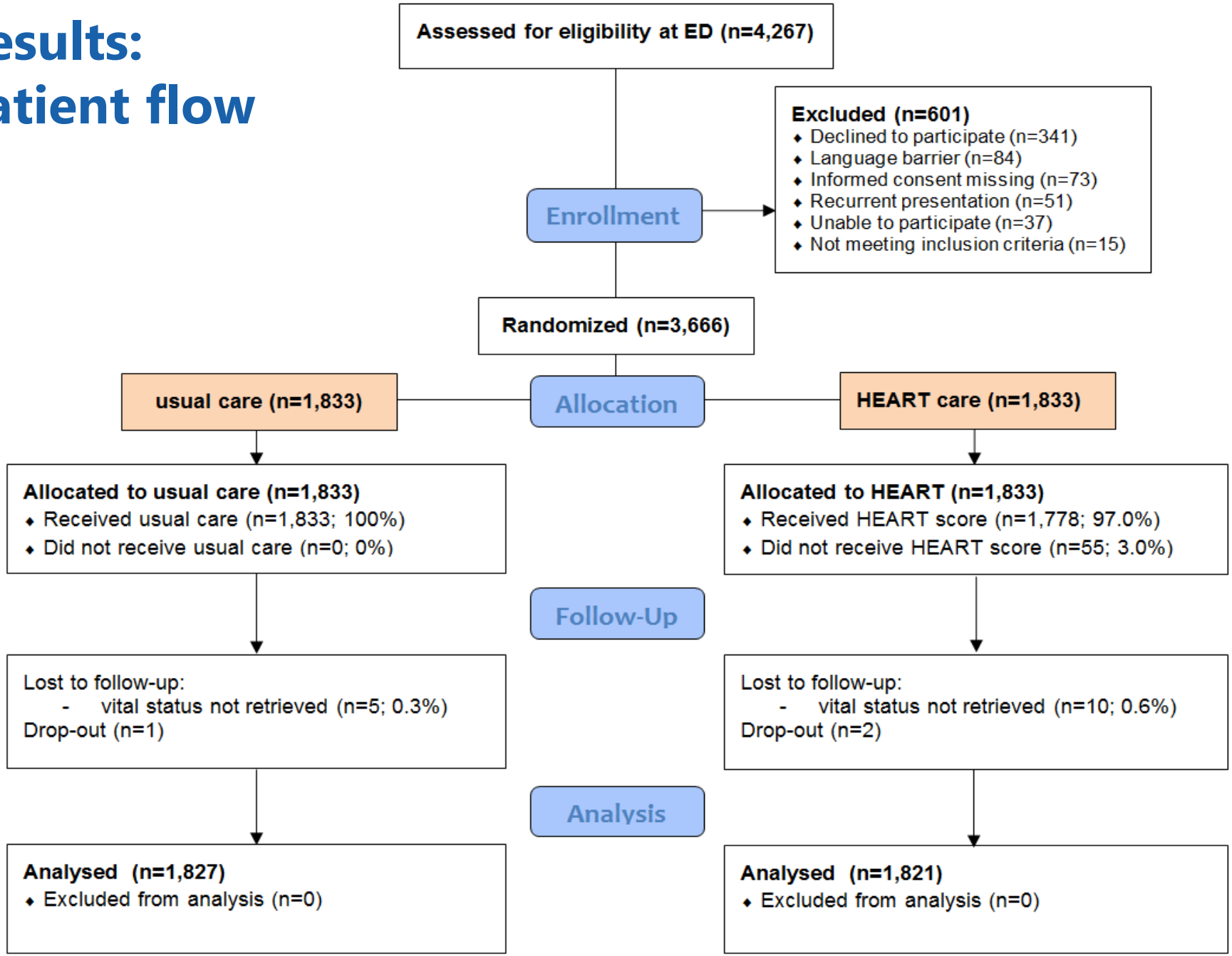
Methods: study protocol



HEART-Impact trial: stepped wedge



Results: patient flow



Results: baseline characteristics

	All patients (N=3,648)	Usual care (N=1,827)	HEART care (N=1,821)
Demographics			
# male	1980 (54%)	1005 (55%)	975 (54%)
Mean age (SD)	62 (14)	62 (14)	62 (14)
History of cardiovascular disease	1266 (35%)	670 (37%)	596 (33%)
HEART score			
HEART score 0-3 (low risk)	-	-	715 (40%)
HEART score 4-6 (intermediate risk)	-	-	861 (49%)
HEART score 7-10 (high risk)	-	-	190 (11%)

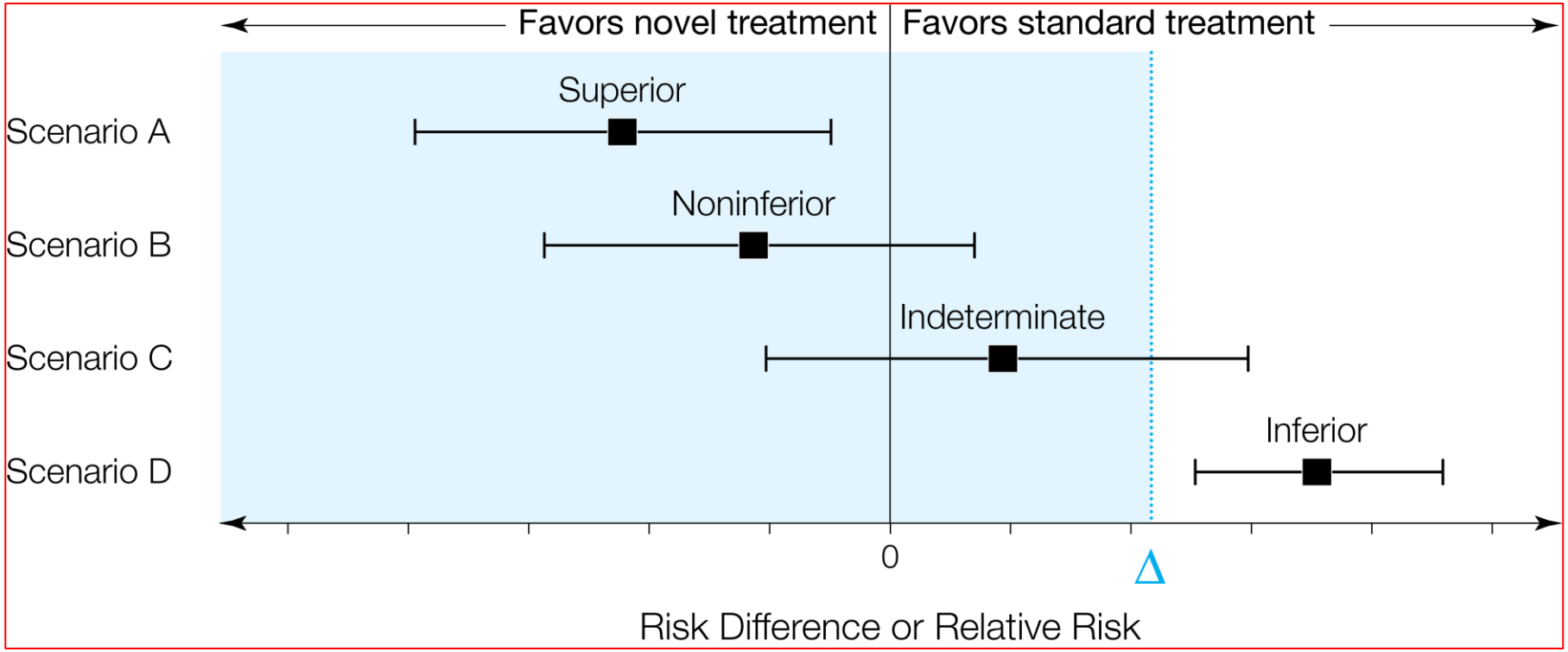
Results: incidence of MACE

	Usual care (n=1,827)	HEART care (n=1,821)	HEART 0-3 (n=715)	HEART 4-6 (n=861)	HEART 7-10 (n=190)
Number of patients with MACE	405 (22.2%)	345 (18.9%)	14 (2.0%)	175 (20.2%)	140 (73.7%)
MACE - components*					
Death – total	9 (0.5%)	5 (0.3%)	1 (0.1%)	2 (0.2%)	2 (1.1%)
Cardiovascular death	6	1	0	0	1
Non-cardiovascular death	0	1	0	0	1
Death by unknown cause	3	3	1	2	0
Cardiac ischemia – total	400 (21.9%)	329 (18.1%)	10 (1.4%)	162 (18.8%)	143 (75.3%)
Unstable angina	157	105	6	70	25
NSTEMI	214	211	4	91	107
STEMI	29	13	0	1	11
Significant stenosis – total	290 (15.9%)	247 (13.6%)	10 (1.4%)	117 (13.6%)	102 (11.8%)
Stenosis managed conservatively	39	41	1	27	13
PCI	208	158	7	70	66
CABG	43	48	2	20	23
Total number of MACE	699	581	21	281	247

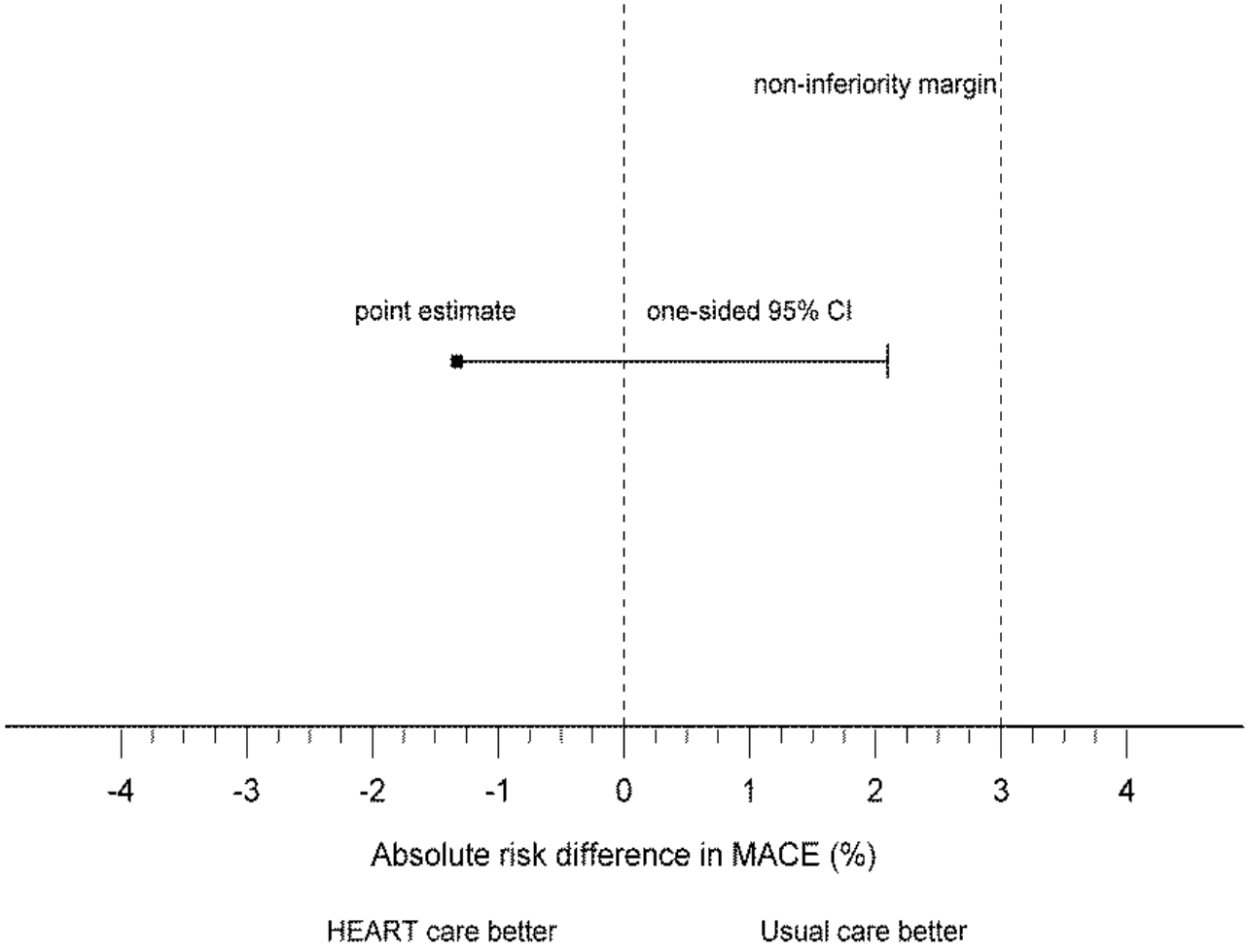
*** total of MACE components exceeds MACE total: 1 patient can have > 1 component**

Results: non-inferiority

- Non-inferiority margin:
  - absolute risk difference in MACE usual care & HEART care
  - 95% one-sided CI of should not exceed margin of **3%**



Results: non-inferiority of HEART care



Results: initial presentation at ED

	Usual care	HEART care	HEART score 0-3	HEART score 4-6	HEART score 7-10	HEART unknown
INFORMATION AVAILABLE IN ALL NINE HOSPITALS	n=1,827	n=1,821	n=715	n=861	n=190	n=55
Initial presentation at ED						
(a) not admitted – no. (%)	1,199 (66%)	1,263 (69%)	648 (91%)	556 (65%)	29 (15%)	30 (55%)
Of which prompt discharge < 4h*	564 (47%)	633 (50%)	416 (64%)	190 (34%)	9 (31%)	18 (60%)
Of which prolonged observation at ED/CPU	635 (53%)	630 (50%)	232 (36%)	366 (66%)	20 (69%)	12 (40%)
Median length of stay at ED in hours:min (P25-P75)	3:57 (2:30-5:57)	3:55 (2:35-5:44)	3:16 (2:21-4:43)	4:40 (2:56-6:20)	3:32 (2:16-5:51)	2:57 (2:17-5:11)
(b) hospital admission – no. (%)	628 (34%)	558 (31%)	67 (9%)	305 (35%)	161 (85%)	25 (45%)
Of which admission to CCU/ICU after ED	296 (47%)	223 (40%)	25 (37%)	104 (34%)	81 (50%)	13 (50%)
Median duration of stay in days (P25-P75)	4 (2-6)	3 (2-6)	2 (2-3)	3 (2-5)	4 (3-8)	4 (2-7)
Total number of days	3365	3085	193	1521	1228	143
Of which days on CCU / ICU	1032	880	44	360	435	41
≥ 1 recurrent visit at ED – no. (%)	266 (15%)	277 (15%)	72 (10%)	151 (18%)	46 (24%)	8 (15%)
Total number of visits	382	380	110	200	59	11
Final diagnosis cardiac ischemia	80	79	11	49	18	1
≥ 1 readmission, non-elective – no. (%)	221 (12%)	193 (11%)	49 (10%)	104 (12%)	37 (19%	3 (5%)
Total number of readmissions	296	261	59	145	51	6
Median number of days (P25-P75)	2 (0-6)	2 (0-6)	2 (0-4)	2 (0-7)	2 (0-7)	2 (0-4)
≥ 1 out-patient clinic visit – no. (%)	1,093 (60%)	1,267 (70%)	381 (53%)	686 (80%)	165 (87%)	35 (64%)
Total number of visits	2730	3203	848	1823	443	89
Specialism cardiology	1505	1779	417	1034	267	61
Specialism other than cardiology	1225	1424	431	789	176	28
≥ 1 new visit at GP for cardiac reason – no. (%) †	195 (11%)	213 (12%)	86 (12%)	102 (12%)	18 (9%)	7 (13%)

Results: recurrent ED visits, readmissions, out-patient clinic visits, GP visits

- No difference after adjustment for clustering and time

Results: diagnostic procedures

	Usual care N=1,176	HEART care N=804	HEART 0-3 N=346	HEART 4-6 N=361	HEART 7-10 N=65	HEART unknown N=32
Number of patients with one or more of the tests mentioned in this table	765 (65%)	461 (57%)	137 (40%)	250 (69%)	56 (86%)	18 (56%)
Diagnostic testing – total numbers	1,565	940	228	541	136	35
Number of tests within first two days	582 (37%)	347 (37%)	49 (21%)	216 (40%)	65 (48%)	17 (49%)
Stress bicycle ECG testing†	465 (40%)	300 (37%)	96 (28%)	175 (48%)	18 (28%)	11 (34%)
Echocardiography (transthoracic)	410 (35%)	243 (30%)	50 (15%)	142 (39%)	43 (66%)	8 (25%)
Nuclear imaging	198 (17%)	89 (11%)	24 (7%)	56 (16%)	8 (12%)	1 (0%)
CT-scan or CT-angiography (excluding PE)	87 (7%)	47 (6%)	16 (5%)	27 (7%)	3 (5%)	1 (0%)
Coronary CT-Angiography (CCTA)	40 (3%)	26 (3%)	14 (4%)	10 (3%)	0 (0%)	2 (1%)
Cardiac MRI	19 (2%)	16 (2%)	6 (2%)	10 (3%)	0 (0%)	0 (0%)
Coronary angiography (CAG)	346 (29%)	219 (27%)	22 (6%)	121 (34%)	64 (98%)	12 (38%)
CAG: normal coronary arteries	41	19	4	13	2	0
CAG: non-significant stenosis	101	69	13	39	14	3
CAG: significant stenosis conservatively treated	28	15	0	12	3	0
CAG: significant stenosis invasively treated	176	116	5	57	45	9

Results: non-adherence to recommended HEART policy

- No discharge in low-risk patients
- No additional testing in high-risk patients

	Usual care	HEART care		HEART low-risk		HEART high-risk	
	N=1,827	N=1,766†		N=715 ‡		N=190	
Adherence to HEART policy*		**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
	n/a	N=1,453	N=313	424	291	168	22
		(82.3%)	(17.7%)	(59.3%)	(40.7%)	(88%)	(12%)
MACE within 6 weeks	405	315	14	3	11	137	3
	(22.2%)	(21.7%)	(4.5%)	(0.7%)	(3.8%)	(82%)	(14%)
MACE only AMI, emergency revascularisation and death	243	203	5	0	5	113	0
	(13.3%)	(14.0%)	(1.6%)	(0%)	(1.7%)	(67%)	(0%)
Discharge ≤4 hours after presentation	564	549	66	359	57	0	9
	(47%)	(37.8%)	(21.1%)	(84.7%)	(19.6%)	(0%)	(40%)
Prolonged observation at ED	635	438	180	65	167	7	13
	(53%)	(30.1%)	(57.5%)	(15.3%)	(57.4%)	(4%)	(59%)
Initial admission to hospital	628	466	67	0	67	161	0
	(34%)	(32.1%)	(21.4%)	(0%)	(23.7%)	(100%)	(0%)
Recurrent ED visits within 3 months	266	233	36	41	31	41	5
	(15%)	(16.0%)	(11.5%)	(9.7%)	(10.7%)	(24%)	(23%)
Non-elective readmissions within 3 months	221	164	26	26	24	35	2
	(12%)	(11.3%)	(8.3%)	(6.1%)	(8.2%)	(21%)	(9%)
Outpatient clinic visits within 3 months	1,093	1,025	207	187	189	144	18
	(60%)	(70.5%)	(66.1%)	(44.1%)	(64.9%)	(86%)	(82%)

What do our results mean?

- **HEART score is safe**
  - No increase of MACE during HEART care
  - Low risk MACE incidence: 2.0% (including UA and elective PCI)

- **Only limited impact on management**
  - After adjustment for clustering and time steps, no difference in early discharge <4 hours, readmissions, recurrent ED visits, out-patient clinic visits, GP visits or diagnostic procedures occurred
  - 232 low-risk patients: prolonged observation at ED/CPU

- **Non-adherence**

Clinical implications

- Use of HEART score safe in work-up chest pain patients
- Identification of barriers for acceptance and use
- Chest pain remains diagnostic dilemma:
  - What is an acceptable risk?

Editorial

When is low-risk chest pain acceptable risk chest pain?

Samantha J Brace-McDonnell,[1,2] Simon Laing[2]

strategy dependent upon the level of risk calculated by the tool. As the authors suggest, the MACS score will require evaluation in comparison to the HEART score.

As clinicians we like risk assessment tools as they are explicit in telling us what

assessment tools. Perhaps now is also the time to seriously evaluate the false positives picked up by current practice and weigh it against the hidden risk that we add, the risk of over investigation and treatment.

HEART Impact trial

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