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Modifiers of the effectiveness of point-of-care troponin testing and determinants of concordance between diagnostic pathway recommendations and disposition in patients with chest pain: a post hoc analysis of a randomised controlled trial

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ABSTRACT

Introduction While point-of-care (POC) high-sensitivity cardiac troponin (hs-cTn) testing has the potential to reduce emergency department (ED) length of stay (LOS), evidence of real world effectiveness is lacking. Our objective was to examine factors that influence the real world effectiveness of POC hs-cTn-based accelerated diagnostic protocols (ADPs) in reducing ED LOS.

Methods This is a post hoc analysis from the "Aiming towards evidence-based interpretation of cardiac biomarkers in patients presenting with chest pain using POC testing" (WESTCOR-POC) study which included 1494 consecutive patients with suspected acute coronary syndrome presenting to the ED at a moderately sized hospital in Norway. Patients were randomised to receive hs-cTn measurements at admission and after 1 hour either by POC or central laboratory testing. This post hoc analysis examines factors affecting the effectiveness of a POC-based ADP and predictors of non-ADP-concordant disposition. Both outcomes were assessed using regression models, with significance level set at p<0.05.

Results Overall, 36.1% of patients met the ADPs' early discharge criteria, of which 66% were discharged. In effect-modification analyses, the effect of POC testing on ED LOS differed by concordance with ADP recommendations (interaction p=0.011), with a reduction among patients with ADP-concordant disposition (−14 min 95% CI −26 to −3), but no corresponding reduction among patients with discordant disposition (13.5 min, 95% CI −4.5 to 31.4). Factors predicting hospital admission despite ADP-recommended discharge were: age >60 years (OR 2.3, 95% CI 1.4 to 3.7, p=0.001), high triage category (OR 1.9, 95% CI 1.2 to 3.0, p=0.003) and suspected serious differential diagnosis (OR 5.9, 95% 3.5 to 9.9, p<0.001).

Conclusion Our findings highlight the need for implementation strategies that support ADP concordant disposition decisions and ensure appropriate patient selection to realise the efficiency potential of POC hs-cTn testing in the ED.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Point-of-care (POC) high-sensitivity cardiac troponin (hs-cTn) testing offers faster turnaround times than central laboratory testing and has the potential to reduce emergency department (ED) length of stay.

⇒ Recent trials have shown inconsistent effects, and the influence of contextual and behavioural factors on real world effectiveness remained unclear.

WHAT THIS STUDY ADDS

⇒ This post hoc analysis from the 'Aiming towards evidence based interpretation of cardiac biomarkers in patients presenting with chest pain using point of care testing' Study of 1494 patients presenting to the ED with symptoms suggestive of acute coronary syndrome highlights that the efficiency gains of implementing POC hs-cTn testing depend on how consistently recommendations from accelerated diagnostic protocols (ADPs) are applied in clinical practice.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ These findings highlight that optimising POC hs-cTn testing requires more than validated algorithms; successful implementation depends on clinician engagement and operational integration.

⇒ Future research and policy should focus on strategies that support ADP concordant disposition decisions and address contextual barriers to maximise the efficiency gains of POC testing in the ED.

INTRODUCTION

Background

Chest pain is a common reason for presentation to the emergency department (ED) and is associated

with high resource utilisation,[1–3] emphasising the need to optimise care pathways to improve efficiency and patient flow. High-sensitivity cardiac troponin (hs-cTn) assays, integrated into accelerated diagnostic protocols (ADPs), can reduce ED length of stay (LOS).[4] Point-of-care (POC) hs-cTn testing offers a potential advantage with faster turnaround time than central laboratory testing.[5]

The overall impact of ADPs and POC hs-cTn testing on real life ED efficiency remains uncertain across clinical settings. While preliminary reports from New Zealand have demonstrated reduction in ED LOS following implementation of POC hs-cTn testing,[6] the 'aiming toWards Evidence baSed inTerpretation of Cardiac biOmarkers in patients pResenting with chest pain using Point Of Care testing' (WESTCOR-POC) Trial on average found no clinically meaningful LOS reduction (−6 min) when comparing POC hs-cTnI testing in comparison to centralised measurements.[7] Previous studies of contemporary cTn POC testing strategies have demonstrated variable effects on efficiency,[8–12] suggesting that both patient-level and system-level factors may influence outcomes.

ADPs aim to enable early discharge of patients stratified to low risk,[13 14] and studies have shown that a large proportion of patients could be safely discharged from the ED.[15 16] However, clinical practice does not always reflect this potential, as disposition decisions often diverge from algorithm-recommended pathways.[17–20] The influence of variation in the application of these recommendations on the efficiency gains from POC hs-cTn testing in the ED is unknown.

Goals of this investigation

This post hoc exploratory analysis of the WESTCOR-POC randomised controlled trial has two main objectives. First, we aimed to identify patient-level and system-level factors that impacted the effectiveness of POC hs-cTn testing on the primary trial outcome of ED LOS.

Second, we aimed to determine the concordance between disposition decisions executed and the recommendations from the 0/1 hour troponin and history, electrocardiogram, age, risk factors, and troponin (HEART) Score-based ADP used in the study, focusing on clinical and operational predictors of deviation from algorithm recommendations.

METHODS

Study design and setting

This is a post hoc analysis of the WESTCOR-POC Trial, a single-centre, prospective, randomised controlled trial conducted at Haukeland University Hospital in Norway. The methods of this study and the primary results have been described previously.[7] The ED at this tertiary care hospital receives adult medical and

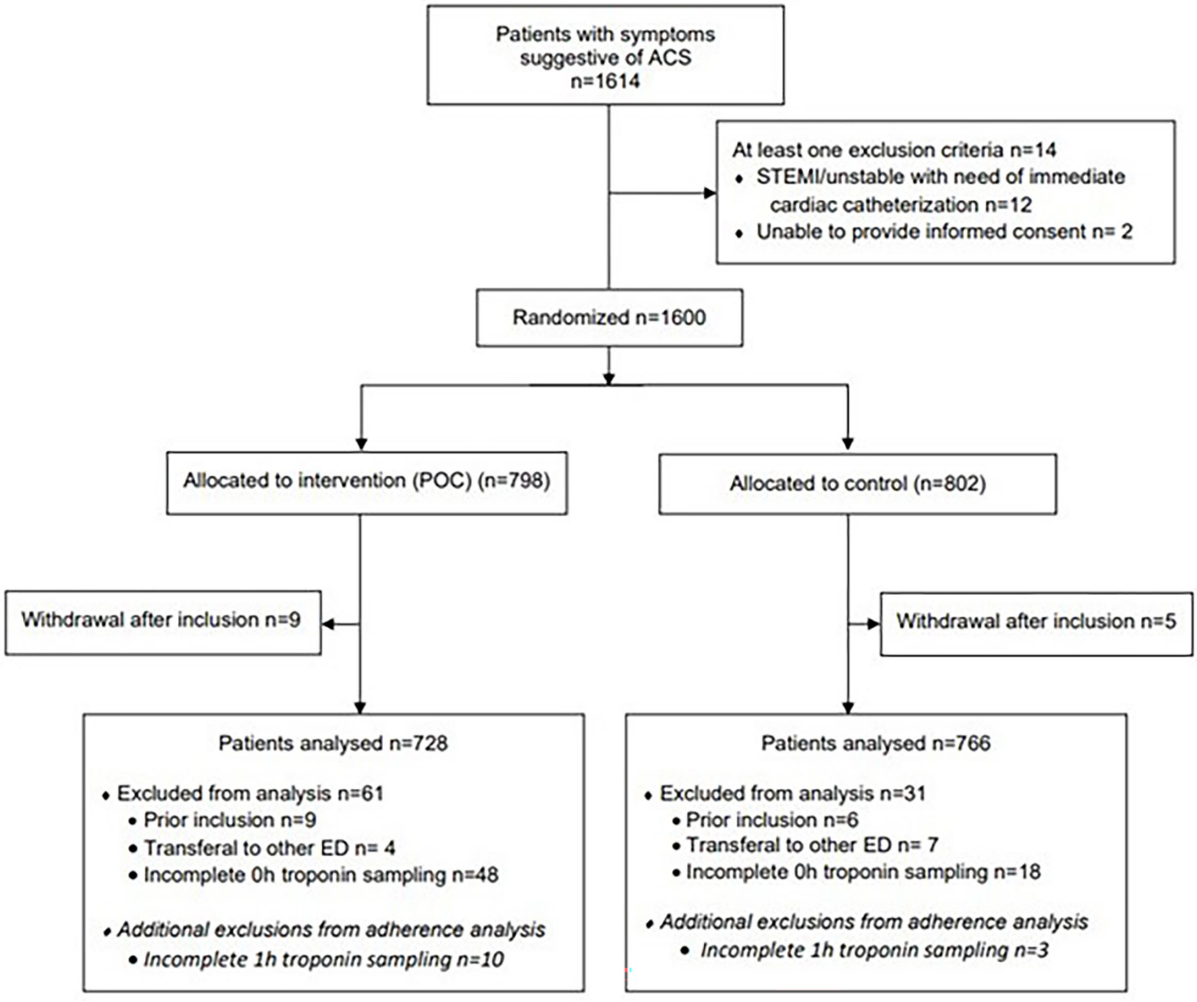

Figure 1 Outline of patient inclusion, exclusion and total study group. ACS, acute coronary syndrome; ED, emergency department; POC, point-of-care; STEMI, ST elevation myocardial infarction.

Table 1 Baseline characteristics

Characteristic	POC (n=728)	Control (n=766)
Age in years, median (IQR)	61 (23)	61 (22)
Age >60 years, n (%)	363 (49.9)	365 (47.7)
Sex, male (%)	418 (57.4)	441 (57.6)
Time from symptom onset to presentation <1 hour, n (%)	7 (1.0)	13 (1.7)
History of atherosclerotic disease, n (%)	204 (28.0)	205 (26.8)
eGFR <60 mL/min/1.73m^2, n (%)	55 (7.6)	70 (9.1)
Clinical suspicion of serious alternative diagnosis, n (%)	147 (20.2)	164 (21.4)
Logistical factors		
Physician workup initiated within 60 min, n (%)*	239 (34.7)	243 (34.3)
Presentation during peak crowding hours, n (%)†	496 (68.1)	534 (69.7)
Presentation during weekend, n (%)	96 (13.2)	79 (10.3)
Presentation during winter months, n (%)‡	389 (53.4)	387 (50.5)
Risk group allocation§		
Rule out, n (%)	277 (38.6)	489 (64.1)
Rule out and HEART Score<4, n (%)	204 (28.4)	330 (43.3)
Observe, n (%)	367 (51.1)	214 (28.0)
Rule in, n (%)	74 (10.3)	60 (7.9)
Disposition		
Discharged from the ED, n (%)	297 (40.8)	305 (39.8)
Disposition concordant with ADP recommendation, n (%)¶	548 (76.3)	546 (71.6)
Adjudicated index diagnosis		
NSTEMI, n (%)	44 (6.0)	35 (4.6)
Unstable angina pectoris, n (%)	45 (6.2)	43 (5.6)
Other cardiac, n (%)	68 (9.3)	76 (9.9)
Other non-cardiac, n (%)	99 (13.6)	112 (14.6)
Unspecified chest pain, n (%)	472 (64.8)	500 (65.3)

*97 patients not analysed due to missing time from ED arrival to evaluation by physician (58 in the standard group, 39 in POC group).
†Peak crowding hours defined as 14:00 hours to 17:00 hours.
‡Winter months defined as October–March.
§13 patients are excluded from risk group analysis due to missing 1 hour hs-cTn sample, 10 in the POC group and 3 in the standard group.
¶ADP concordant disposition decision is defined as discharge in patients meeting the discharge criteria (0/1 hour rule out and HEART Score <4) and admission in patients not meeting the discharge criteria.
ADP, accelerated diagnostic protocol; ED, emergency department; eGFR, estimated glomerular filtration rate; NSTEMI, non-ST elevation myocardial infarction; POC, point-of-care.

surgical patients and is staffed by both emergency physicians and junior doctors training in emergency medicine as well as other specialities. For triage, a modified South African Triage Scale is used, and lab work is ordered by nurses at the initial triage. The ED has a relatively short LOS for patients with chest pain (≈3 hours) and the turnaround time for central laboratory hs-cTnT during the study period was within guideline recommendations for most measurements (71%–91% reported within 60 min). The original trial evaluated whether POC hs-cTnI testing using a 0/1 hour ADP could reduce ED LOS compared with central laboratory hs-cTnT testing. The study was registered at ClinicalTrials.gov (NCT05354804).

Study population

All patients aged ≥18 years who presented to the ED with symptoms suggestive of acute coronary syndrome (ACS) between March 2022 and March 2024 were eligible for inclusion in the main trial. Exclusion criteria included ST elevation myocardial infarction (STEMI), haemodynamic instability requiring urgent coronary angiography, suspected life expectancy <2 months, interhospital transfers and inability to provide informed consent. We used a modified intention-to-treat approach where duplicate inclusions and patients missing allocated admission hs-cTn sample were excluded.

Interventions

hs-cTn testing was performed in all patients at admission and 1 hour later. Patients in the POC arm had hs-cTnI measured by the Atellica VTLi analyser (Siemens Healthineers).

Only a single sample rule out of <4 ng/L had been published for this assay at the start of the study.[21] Based on this and correlations with other central laboratory assays (Siemens Atellica, Abbott Alinity, Roche Diagnostic Elecsys) we selected a value <6 ng/L at admission combined with a 1 hour delta <3 ng/L as a 'rule-out' criteria, acknowledging that higher cut-offs are generally applicable when two samples are obtained.[13] This baseline cut-off has since been supported by findings from Cullen *et al*.[22] Values above the 99th percentile (23 ng/L) were suggested as a provisional 'rule-in' cut-off to inform clinicians of patients at high risk of non-ST elevation myocardial infarction (NSTEMI). In the control arm, hs-cTn was measured in the central laboratory using an hs-cTnT assay from Roche Diagnostics with validated assay-specific risk group cut-offs (<12 ng/L and 1 hour delta of <3 ng/L for 'rule-out' and >52 ng/L and 1 hour delta of ≥5 ng/L for 'rule-in').

A single-sample rule-out strategy was not implemented, as the total turnaround time for hs-cTnT results was expected to be approximately 60 min or more. A 3 hour hs-cTnT sample was recommended in patients with ongoing

Table 2 Effect modifiers of the impact of point-of-care troponin testing on emergency department length of stay

Effect modifier	Level	Mean difference (Control vs POC), minutes	95% CI	Interaction P value
Sex	Female	−9.4	−24.2 to 5.5	0.763
	Male	−6.4	−19.1 to 6.4	
Age	≤60 years	−10.2	−24.0 to 3.5	0.603
	>60 years	−5.1	−18.7 to 8.6	
History of atherosclerotic disease	Yes	−12.3	−30.9 to 6.2	0.558
	No	−5.8	−17.23 to 5.5	
eGFR (nL/min/1.73 m^2)	<60	−7.6	−41.4 to 26.1	0.992
	≥60	−7.5	−17.6 to 2.7	
Time to physician workup¶	≤60 min	−13.9	-25.6 to 2.2	0.066
	>60 min	4.8	−11.3 to 20.9	
Presentation during peak demand*	Yes	−13.6	−31.0 to 3.8	0.427
	No	−5.0	−16.7 to 6.6	
Presentation during winter months†	Yes	−5.6	−19.1 to 7.8	0.663
	No	−10.0	−24.0 to 4.0	
Presentation during weekend	Yes	−8.7	−37.1 to 19.8	0.936
	No	−7.5	.17.8 to 2.9	
Documented suspicion of serious alternative diagnosis	Yes	−5.9	−27.1 to 15.4	0.868
	No	−7.9	−18.8 to 3.0	
Risk group allocation‡				
0/1 hour hs-cTn 'Rule-out'	Yes	−8.7	−22.7 to 5.4	0.668
	No	−4.3	−18.6 to 10.1	
0/1 hour hs-cTn 'Rule-out' and HEART Score <4	Yes	−10.2	−26.8 to 6.5	0.466
	No	−2.5	−14.7 to 9.7	
0/1 hour hs-cTn 'Observe'	Yes	−2.6	−18.7 to 13.4	0.386
	No	−11.7	−24.5 to 1.1	
0/1 hour hs-cTn 'Rule in'	Yes	−17.8	−50.2 to 14.6	0.498
	No	−6.1	−16.2 to 4.1	
Discharged home	Yes	−4.2	−18.9 to 10.6	0.494
	No	−10.8	−23.0 to 1.4	
ADP concordant disposition decision§	Concordant	−14.4	−25.9. to 2.9	**0.011**
	Discordant	13.5	−31.4 to 4.5	
Adjudicated diagnosis				
NSTEMI	Yes	−31.3	−73.5 to 11.0	0.248
	No	−5.7	−15.6 to 4.2	
Unstable angina pectoris	Yes	−3.5	−43.4 to 36.4	0.837
	No	−7.8	−17.7 to 2.2	
Other cardiac	Yes	−16.2	−47.4 to 15.1	0.577
	No	−6.8	−17.0 to 3.4	
Other non-cardiac	Yes	−8.4	−34.1 to 17.4	0.938
	No	−7.3	−17.7 to 3.2	
Unspecified chest pain	Yes	−3.5	−15.5 to 8.6	0.253
	No	−15.3	−31.7 to 1.1	

*Peak crowding hours defined as 14:00 hours to 17:00 hours.
†Winter months defined as October–March.
‡13 patients are excluded from risk group analysis due to missing 1 hour hs-cTn sample (10 in the POC group and 3 in the standard group).
§ADP concordant disposition decision is defined as discharge in patients meeting the discharge criteria (0/1h rule out and HEART Score <4) and admission in patients not meeting the discharge criteria.
¶97 patients not analysed due to missing time from ED arrival to evaluation by physician (58 in the standard group and 39 in the POC group).
ADP, accelerated diagnostic protocol; ED, emergency department; eGFR, estimated glomerular filtration rate; hs-cTn, high-sensitivity cardiac troponin; LOS, length of stay in minutes; NSTEMI, non-ST elevation myocardial infarction; POC, point-of-care.

or recurrent symptoms and for patients not classified into either 'rule-out' or 'rule-in' following the 0 hour and 1 hour samples. A 3 hour sample was also recommended for patients presenting within 1 hour from symptom onset, based on the 2023 European Society of Cardiology guidelines for management of ACS. online supplemental material In the supplementary data, the guideline advise considering an additional hs-cTn measurement in very early presenters (<1 hour) to account for the time-dependent release of troponin. Further, consecutive hs-cTn measurements and any additional laboratory tests were analysed in the central laboratory. Early discharge was recommended for patients who met rule-out criteria based on the 0/1 hour hs-cTn algorithms and had a HEART Score <4 if no serious alternate

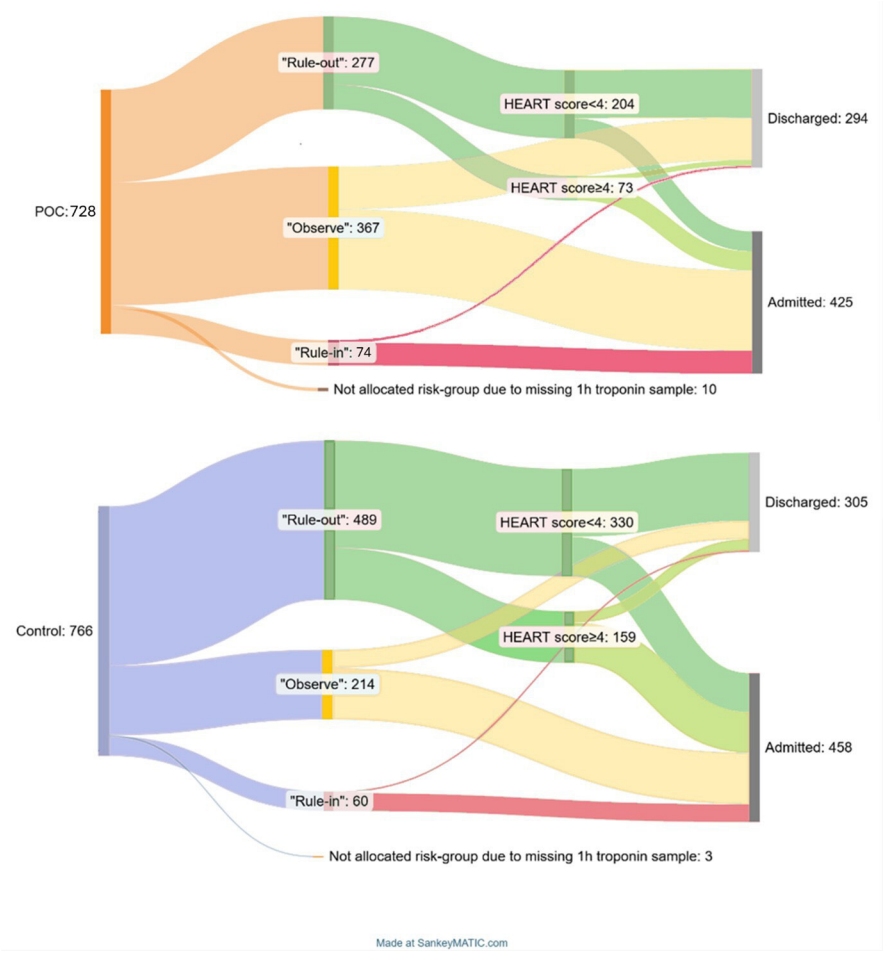

Figure 2 Sankey diagram of risk group allocation, HEART Score and emergency department disposition in the POC and control groups. POC, point-of-care.

diagnosis was suspected. Final decisions regarding treatment, admission or discharge were made at the discretion of the attending physician.

Outcomes and measurements

A post hoc exploratory analysis was performed to identify factors that impacted the effect of POC testing on the primary outcome of ED LOS. ED LOS was defined as time from arrival to the ED to the actual time of leaving the ED and was extracted from the hospital's logistical software system. The time of actual disposition decision was not available in our electronic system.

The second exploratory outcome was concordance between disposition decisions and the disposition recommendations provided by the ADP. Concordance was defined as ED discharge in patients meeting the early discharge criteria (hs-cTn 0/1 hour 'rule-out' and HEART Score <4) or hospital admission in patients not meeting the early discharge criteria. Risk group allocation was calculated based on the admission and 1 hour hs-cTn sample ('rule-out', 'rule-in' or 'observe') and HEART Score (<4 vs ≥4) and disposition was extracted from the hospitals' logistical software system.

Candidate effect modifiers were selected based on clinical plausibility. Patient-related factors such as sex, age (<60 years vs ≥60 years), kidney failure (eGFR <60 mL/min/1.73 m² vs ≥60 mL/min/1.73 m²), history of atherosclerotic disease and clinical suspicion of serious disease other than NSTEMI, including unstable angina, were extracted from the patient medical records. The age cut-off of 60 years was chosen to achieve an approximately even distribution between age groups. Time of day (presentation during peak demand periods (14:00 hours to 17:00 hours) versus presentation outside peak demand), time of week (weekday vs weekend), time of year (summer vs winter months), ED LOS, final disposition and triage (high triage (orange or red) vs low triage (yellow or green)) were extracted from the logistical software. Time to physician assessment, not including initial triage, (<60 min vs >60 min), was registered by research nurses. Adjudication of index diagnoses was performed by two independent cardiologists based on all available clinical data up to 30 days after inclusion. NSTEMI and unstable angina pectoris diagnosis were adjudicated based on the fourth universal definition of myocardial infarction[23] using hs-cTn measurements with sex-specific cut-offs.

Statistical analysis

Effect modification was assessed by including an interaction term between the intervention and control groups (POC vs control) and each candidate variable in separate linear regression models with ED LOS as the dependent variable. For each model, the estimand was the adjusted mean difference in LOS between the POC and control groups within each level of the candidate variable, reported with 95% CIs. A significance threshold of $p<0.05$ was used to identify potential effect modifiers.

Patient risk group allocation and disposition are illustrated using a Sankey diagram (SankeyMATIC.com). To identify

Table 3 Baseline characteristics and index events by risk group and disposition (n=1481)

	Early discharge recommended by ADP (n=534)		Early discharge not recommended by ADP (n=947)	
Variable	**Discharged (n=353)**	**Admitted (n=181)**	**Discharged (n=246)**	**Admitted (n=701)**
Sex, male, n (%)	184 (52.1)	91 (50.3)	140 (56.9)	435 (62.1)
Age, median (IQR)	48 (21)	53 (18)	68 (19)	68 (18)
Age >60 years, n (%)	57 (16.1)	54 (29.8)	159 (64.6)	479 (68.3)
eGFR <60 mL/min/1.73m^2, n (%)	3 (0.8)	2 (1.1)	27 (11.0)	93 (13.3)
Atherosclerotic disease, n (%)	20 (5.7)	16 (8.8)	85 (34.6)	285 (40.7)
Time to physician workup <60 min, n (%)*	192 (61.0)	119 (69.6)	126 (57.0)	469 (68.9)
Clinical suspicion of serious alternative diagnosis, n (%)	29 (8.2)	63 (34.8)	20 (8.1)	198 (28.2)
Presentation during peak demand hours, n (%)†	116 (32.9)	54 (29.8)	75 (30.5)	216 (30.8)
Presentation during winter months, n (%)‡	187 (53.0)	89 (49.2)	125 (50.8)	369 (52.6)
Presentation during weekend, n (%)	31 (8.8)	16 (8.8)	34 (13.8)	92 (13.1)
Randomisation, POC, n (%)	144 (40.8)	60 (33.1)	150 (61.0)	364 (51.8)
Coronary investigations, n (%)	43 (8.0)	114 (63.0)	40 (16.3)	472 (67.3)
Exercise ECG	0	6 (3.3)	0	39 (5.6)
CT coronary angiography	3 (0.8)	103 (56.9)	9 (3.7)	309 (44.1)
Invasive coronary angiography	0	9 (5.0)	0	200 (28.5)
PCI/CABG	0	4 (2.2)	0	111 (15.8)
Referral to outpatient coronary angiography	40 (11.3)	7 (3.9)	31 (12.6)	17 (2.4)
Adjudicated diagnosis, n (%)				
NSTEMI	0	0	1 (0.4)	76 (10.8)
Unstable angina pectoris	1 (0.3)§	4 (2.2)§	2 (0.8)§	78 (11.1)
Other cardiac	5 (1.4)	11 (6.1)	24 (9.8)	103 (14.7)
Other non-cardiac	50 (14.2)	23 (12.7)	35 (14.2)	101 (14.4)
Unspecified chest pain	297 (84.1)	143 (79.0)	184 (74.8)	343 (48.9)

*n=1388 for time to physician workup due to 93 patients missing time from ED arrival to evaluation by physician.
†Peak demand hours defined as 14:00 hours to17:00 hours.
‡Winter months defined as October–March.
§Information about patients with adjudicated ACS diagnosis who were recommended for early discharge by the ADP or not recommended for early discharge but still discharged is provided in the online supplemental material.
ADP, accelerated diagnostic protocol; CABG, coronary artery bypass graft surgery; eGFR, estimated glomerular filtration rate; NSTEMI, non-ST elevation myocardial infarction; PCI, percutaneous coronary intervention; POC, point-of care.

factors associated with ADP discordant disposition, multivariable logistic regression analyses were performed separately for patients who met the discharge criteria, and for those who did not meet the discharge criteria. Among the patients meeting the discharge criteria, the estimand was the adjusted OR for hospital admission. Among the patients not meeting the discharge criteria, the estimand was the adjusted OR for hospital discharge. All estimates are reported with 95% CIs. The overall explanatory power of each model was assessed using Nagelkerke's pseudo-R^2. The statistical analysis was performed using SPSS Statistics (V.29.0) and R (V.4.3.3).

RESULTS

Study population

From March 2022 to March 2024, 1614 patients presenting with symptoms indicative of ACS were assessed for eligibility at the study site. Of these, 14 patients met the exclusion criteria: 12 required urgent cardiac catheterisation due to STEMI or haemodynamic instability, and 2 were unable to provide informed consent. The remaining 1600 participants were randomised to either the POC intervention arm (n=798) or the control arm (n=802). Following randomisation, 14 individuals withdrew consent and were not included in further analyses. An additional 92 patients were excluded from the analysis (15 with prior enrolment in the study; 11 who were directly transferred to another ED; and 66 with missing baseline troponin results). This yielded a LOS analysis cohort of 1494 patients: 728 in the POC group and 766 in the control group. An overview of patient inclusion, randomisation and exclusions is provided in figure 1. Baseline characteristics and adjudicated diagnosis have been published previously[7] and were similar between groups (table 1). There was a difference in rule-out ability between the two 0/1 hour algorithms, where a smaller proportion of patients were allocated to 'rule-out' in the POC group compared with the control group (39% vs 64%). The ADP early discharge criteria (0/1 hour 'rule-out' and HEART Score <4) were met by 28% of patients in the POC group and 43% in the control group.

Modifiers of the effectiveness of POC troponin testing

In the post hoc effect modification analyses, the effect of POC testing differed according to whether patients' actual dispositions were in concordance with the ADPs disposition recommendation (interaction p=0.011). Among patients with concordant disposition, POC testing was associated with a reduction in ED LOS of 14 min compared with the control group (−14.4 min, 95% CI −25.9 to −2.9). In contrast, patients with non-concordant disposition decisions had a longer ED LOS than the control group (13.5 min, 95% CI −4.5 to 31.4). No statistically significant evidence for effect modification was observed for sex, age, kidney failure, known atherosclerotic disease, presentation

during time of peak demand, time to physician assessment or adjudicated diagnosis. A summary of subgroup-specific effect estimates and interaction p values is provided in table 2.

Diagnostic pathway recommendations and disposition concordance

Figure 2 displays patient flow of the POC and standard care groups through risk group allocation, and final disposition. Of the 1495 patients allocated to either the POC (n=728) or control (n=766) group at baseline, 1 hour hs-cTn samples and HEART Scores were available for 1481 patients. Among these, 534 (36.1%) met the early discharge criteria (0/1 hour 'rule-out' and HEART Score <4), 181 of them (33.9%) were admitted. Of the remaining 947 patients who did not meet the early discharge criteria, 246 patients (26.0%) were discharged from the ED.

Table 3 outlines baseline characteristics, coronary investigations and clinical outcomes by risk group and disposition. Factors associated with discordance between disposition decisions and ADP recommendations that were identified in the post hoc analysis are presented in table 4. Among patients suggested for early discharge by the ADP, none were diagnosed with NSTEMI, <1% were diagnosed with unstable angina pectoris (0.3% of patients who were discharged and 2.2% in the admitted patients) and the majority of patients were diagnosed with unspecified chest pain (84% in the discharged group and 79% in the admitted group). Of the patients who were admitted in discordance with the ADP recommendation, 34.8% had a documented suspicion of serious disease other than NSTEMI (including unstable angina pectoris) and a substantial proportion (58%) underwent further coronary investigations with coronary angiography (coronary CT or invasive angiogram) during admission. Age >60 years (OR 2.26, 95% CI 1.38 to 3.71, p=0.001), high triage category (OR 1.93, 95% CI 1.24 to 2.97, p=0.003) and suspected serious alternate diagnosis (OR 5.87, 95% CI 3.47 to 9.93, p<0.001) were associated with higher likelihood of admission in patients suggested for early discharge by the ADP. Although the logistic regression model, including all the available relevant clinical factors, identified significant predictors, explanatory power was limited (Nagelkerke R^2 = 0.21), suggesting that unmeasured factors substantially influenced decision-making.

Patients who were discharged even though this was not recommended by the ADP had similar adjudicated diagnosis as the group who met the early discharge criteria (0.4% NSTEMI, 0.8% unstable angina pectoris and 74.8% unspecified chest pain). Patients with ADP-concordant admission had higher rates of serious disease (10.8% NSTEMI, 11.1% unstable angina pectoris and 48.9% unspecified chest pain). Randomisation to the POC group (OR 1.46, 95% CI 1.04 to 2.05, p=0.030) was associated with a higher likelihood of discharge in patients not suggested for early discharge by the ADP. High triage category (OR 0.68, 95% CI 0.48 to 0.98, p=0.04), time to physician attendance <60 min (OR 0.66, 95% CI 0.44 to 0.91, p=0.013)

Table 4 Factors associated with discordance between disposition decisions and disposition recommended by the ADP

OR for admission in patients recommended for early discharge*		
Variable	**OR**	**95% CI**
Sex, male	1.034	0.680 to 1.573
Age >60 years	2.259	1.375 to 3.712
GFR <60 mL/min/1.73 m^2	1.207	0.142 to 10.227
Atherosclerotic disease	1.432	0.658 to 3.113
Time to physician <60 min	1.165	0.736 to 1.842
Presentation during peak demand hours†	1.171	0.744 to 1.845
High triage urgency (SATS red/orange)	1.927	1.249 to 2.974
Clinical suspicion of other serious disease	5.871	3.472 to 9.926
Randomisation POC	0.734	0.479 to 1.125
Presentation during winter months‡	0.818	0.543 to 1.233
Presentation during weekend	1.066	0.509 to 2.234
Adjudicated acute ACS (NSTEMI/unstable angina pectoris)	7.744	0.719 to 83.445
OR for hospital discharge in patients not recommended for early discharge*		
Sex, male	0.921	0.652 to 1.301
Age >60 years	1.065	0.734 to 1.545
GFR <60 mL/min/1.73 m^2	0.898	0.529 to 1.525
Atherosclerotic disease	0.827	0.573 to 1.193
Time to physician <60 min	0.663	0.441 to 0.910
Presentation during peak demand hours†	0.750	0.518 to 1.084
High triage urgency (SATS red/orange)	0.682	0.476 to 0.978
Clinical suspicion of serious alternative diagnosis	0.190	0.115 to 0.315
Randomisation POC	1.458	1.038 to 2.046
Presentation during winter months‡	0.863	0.618 to 1.205
Presentation during weekend	1.553	0.935 to 2.579
Adjudicated acute ACS (NSTEMI/unstable angina pectoris)	0.035	0.011 to 0.113

*Patients were recommended for early discharge if they were allocated to 'rule-out' by the 0/1 hour algorithm, and had a HEART Score <4.
†Peak demand hours defined as 14:00 hours to 17:00 hours.
‡Winter months defined as October–March.
ACS, acute coronary syndrome; ADP, accelerated diagnostic protocol; GFR, glomerular filtration rate; NSTEMI, non-ST elevation myocardial infarction; POC, point-of-care; SATS, South African Triage Scale.

and clinical suspicion of other serious alternative diagnosis (OR 0.190, 95% CI 0.12 to 0.32, p=<0.001) was associated with a lower likelihood of discharge in patients not suggested for early discharge.

DISCUSSION

This post hoc analysis highlights that the efficiency gains of implementing POC hs-cTn testing depend on how consistently recommendations from ADPs are applied in clinical practice. It further explores how different factors influence concordance between disposition decisions and the disposition recommendations provided by the ADP. Our findings offer insights into the implementation of hs-cTn POC assays and ADPs into routine ED care.

We found that concordance between disposition decision and disposition recommendation by the ADP significantly modified the ED LOS effect of POC testing. Patients discharged or admitted in concordance with the ADP recommendation experienced a greater LOS reduction. It is possible that physicians' decisions are more concordant with ADPs when the clinical situation is fairly obvious (in clearly low-risk or high-risk patients) and that these dispositions therefore take shorter time and the turnaround time for the blood samples becomes more important.

Our results also emphasise the complexity of diagnostic decision-making in the ED. Among patients suggested for early discharge by the ADP, admission was still frequent. This discordance could only partly be explained by a documented suspicion of serious alternative diagnoses and a substantial proportion of these low-risk patients underwent continued investigation for ACS including coronary angiography. While our regression models identified significant predictors of disposition decisions, their overall explanatory power was limited. This likely reflects the influence of unmeasured factors both at the patient level and the system level. Patient-level factors may include frailty or social circumstances, while system-level factors may involve physician experience, confidence in the ADP, departmental workload and hospital bed availability. Our findings likely reflect real world uncertainty and variation in clinical judgement and are in line with previous findings.[17–20] Previous studies have shown that physician risk estimation is often inconsistent and may not align with objective risk scores, which generally provide more reliable risk discrimination.[24 25] Some clinicians also remain reluctant to apply risk scoring instruments in individual patient care.[26] In practice, this may contribute to the observed tendency to admit low-risk patients.

In summary, findings highlight that the effectiveness of POC troponin testing and ADP concordant disposition decisions are impacted by several contextual factors. Optimising ADP performance therefore requires not only validated decision tools, but also context-sensitive implementation strategies that address operational barriers, facilitate workflow integration and engage front-line clinicians. Future research should incorporate system-level variables and provider factors to better understand and optimise the real world performance of rapid diagnostic protocols in diverse ED settings.

Limitations

The limitations of the original trial have been described previously in detail[7] and include the single-centre design, which may limit generalisability. Although the study was designed to reflect routine clinical practice, trial participation might have influenced clinician behaviour (Hawthorne effect), and the findings may not fully represent real world practice. Another main limitation was the lack of validated 0/1 hour cut-offs for the POC ADP, which led to a marked difference in rule-out ability in comparison to the control group (39% vs 64%) and likely limited the efficiency. Using a less optimal ADP for POC may also explain the lower concordance with ADP recommendations seen in this group. Furthermore, we did not provide guidance regarding single-sample rule-out, which potentially could have improved efficiency further. We also relied on clinical documentation to assess factors such as suspicion of serious differential diagnosis, which may be lacking or prone to misclassification. Finally, as these are post hoc analyses and exploratory in nature, findings should be interpreted accordingly.

CONCLUSION

In this post hoc analysis from a randomised trial, ADP concordant dispositions were associated with shorter LOS with POC testing. We also identified several factors that were associated with non-concordant disposition decisions. Our findings highlight the need for implementation strategies that support ADP concordant disposition decisions and ensure appropriate patient selection to unleash the potential of POC hs-cTn testing to reduce ED LOS.

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Contributors KMA conceived the study, designed the trial, obtained research funding and supervised the conduct of the trial. VILT supervised recruitment of participants, established the case report form, and collected and plotted the data. VILT and GMSM performed the statistical analysis. KMA, KV and ROB were included in the steering committee. TO, POC, FSA, LC and RB were scientific advisors for the study and critically reviewed and revised the manuscript. OCL, JK, SMFJ, OTS and TMN also provided scientific advice during the conduct of the study and OCL and JK performed adjudication of the index diagnosis. TW provided statistical advice on the study design. VILT drafted the manuscript, and all authors contributed substantially to its revision. KMA serves as the guarantor and accepts full responsibility for the integrity of the work.

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Competing interests KMA has served on the advisory board for Roche Diagnostics, Abbott Diagnostics, Radiometer, Siemens Healthineers and SpinChip, receives consultant honoraria from CardiNor, lecturing honorarium from Siemens Healthineers, Roche Diagnostics, Wondfu, Mindray and Snibe Diagnostics and

research grants from Siemens Healthineers and Roche Diagnostics. She is Associate Editor of *Clinical Biochemistry* and Chair of the IFCC Committee of Clinical Application of Cardiac Bio-markers. TO has received speaker and/or consultancy honoraria from Abbott Diagnostics, CardiNor, Roche Diagnostics, SpinChip and Siemens Healthineers, and has received research support from Abbott Diagnostics, CardiNor, ChromaDex, Novartis and Roche Diagnostics, via Akershus University Hospital. TO serves as an Associate Editor of *Circulation* and as a consultant for the IFCC Committee of Clinical Application of Cardiac Bio-markers. LC has served on advisory boards for Abbott Diagnostics, Siemens Healthineers and receives consultant honoraria from Abbott Diagnostics, Siemens Healthineers, Quidel/Ortho and Roche. She is a member of the IFCC Committee of Clinical Application of Cardiac Bio-markers and the ESC Acute Cardiovascular Care Biomarker Committee. FSA serves on the advisory boards for Werfen and Abbott Vascular, is a consultant for Mindray, has received non-salaried grants from Abbott Diagnostics, Abbott POC, Beckman Coulter, Quidel/Ortho, BD, Roche Diagnostics, Siemens Healthineers and Sysmex, is an Associate Editor of *Clinical Chemistry* and is a Consultant to the IFCC Committee of Clinical Application of Cardiac Bio-Markers. RB has received research grants from Roche Diagnostics, Abbott Point of Care and Siemens Healthineers, and his institution has received honoraria for consultancy with Roche Diagnostics, Beckman Coulter, LumiraDx, Siemens Healthineers and Prolight Diagnostics. RB is Editor-in-Chief of *Emergency Medicine Journal*. POC has served on advisory boards for Radiometer and Abbott and received speaker fees from QuidelOrtho and is a Consultant to the IFCC Committee of Clinical Application of Cardiac Bio-Markers. TMN has received speaker honoraria from Sanofi, is a Member of the ESC Ethics Committee and is an Associate Editor of the *European Journal of Cardiovascular Nursing*. VILT, SMFJ, GMSM, OCL, JK, OTS, TW, KV and ROB report no conflicts of interest.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

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