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CLINICAL RESEARCH
Acute coronary syndromes

Impact of high-sensitivity cardiac troponin on use of coronary angiography, cardiac stress testing, and time to discharge in suspected acute myocardial infarction

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[a]P-value for comparisons between Phase A and Phase B adjusted for age, history of coronary artery disease, and presence of arterial hypertension with the use of a multivariate regression model.
[b]Percentage refers to total number patients undergoing the respective diagnostic exam, not to total number of patients.
[c]Multi-vessel interventions were counted as one percutaneous coronary intervention.

Impact of high-sensitivity cardiac troponin T on cardiac stress testing

In 25% ($n = 623$) of patients, some form of cardiac stress testing to detect myocardial ischaemia was performed. Of these, cardiac single-photon emission computerized tomography (SPECT) was performed in 44% and exercise ECG in the remaining 56% of patients. The rate of SPECT (12% of all patients during Phase A vs. 10% during Phase B, adjusted-$P = 0.984$) was similar during both periods as was the percentage of pathological SPECT findings (47% of all SPECT exams during Phase A vs. 38% during Phase B, adjusted-$P = 0.126$). The rate of exercise ECG was significantly reduced after the introduction of hs-cTnT (17% of all patients during Phase A vs. 9% during Phase B, adjusted-$P < 0.001$), while the percentage of pathological findings remained comparable (15% of all exercise ECG exams during Phase A vs. 14% during Phase B, adjusted-$P = 0.906$).

Impact of high-sensitivity cardiac troponin T on duration of stay

Duration of stay in the ED among all patients was significantly reduced by 72 min after the introduction of hs-cTnT (median stay 377 min during Phase A vs. 305 min during Phase B; adjusted-$P = 0.046$). Even more pronounced in the subgroup of patients in whom discharge from the ED was feasible (outpatients), median time to discharge was significantly reduced by 79 min (median stay 355 min during Phase A vs. 276 min during Phase B, adjusted-$P < 0.001$, *Figure 3*). A significant change in trends on duration of stay in the ED from a mean increase of 0.63 min per month during Phase A vs. a mean decrease of 3.27 min per month during Phase B could be observed with the use of interrupted time series analyses ($P < 0.001$, *Figure 4*).

Length of hospitalization, quantified by overnight stays, did not differ significantly between the two phases (median overnight

plied in low-to-moderate risk patients. *Third*, the availability of more precise biomarker information in the lower range as offered by hs-cTnT was associated with improved allocation of patients to further diagnostic cardiac testing: low-risk patients as identified by very low levels of hs-cTnT to no further cardiac testing and high-risk patients as identified by elevated levels of hs-cTnT to coronary angiography. *Fourth*, in patients who were candidates for discharge from the ED, the use of hs-cTnT was associated with a significant reduction in time to discharge by nearly 80 min, related to more rapid rule-out of AMI. Interrupted time series analyses documented a significant change in trends on duration of stay in the ED from a mean increase of 0.63 min per month during Phase A vs. a mean decrease of 3.27 min per month during Phase B. *Fifth*, in parallel, total costs were also reduced by 20% in patients managed as outpatients. Again, interrupted time series analyses revealed a significant change in trend on total costs from a mean increase of €5.05 per month during Phase A to a mean decrease of €12.12 per month during Phase B, while mean total costs remained similar in the overall population during both phases. *Sixth*, the reduction in stress testing and the reduction in time to discharge from the ED were not observed in a control group of patients recruited during the same time period in three hospitals not switching to hs-cTnT. In contrast, time-to-discharge increased in the control group.

These findings corroborate and extend prior studies highlighting the increased diagnostic accuracy achieved with hs-cTnT, recent studies exploring the best possible application of hs-cTnT, as well as recent modelling performed to estimate its cost-

setting by the investigators. First, if this would be the case, hospitals not switching to hs-cTn should have had the same reduction in time to discharge in outpatients. This was not observed. Second, all participating institutions applied the clinical practice guidelines of the ESC, which remained unchanged during the enrolment period for the use of conventional cTn assays.[1,24] Third, interrupted time series analyses documented a significant change in trends on duration of stay (and costs) at the time of the clinical introduction of hs-cTnT. Fourth, most of the insights gained from our previous work in APACE are specific to the use of hs-cTn.[16–23]

In addition to the cTn assay itself, the respective cut-off levels selected for clinical use may impact on management decisions and resource utilization. The clinical cut-off levels for the fourth-generation cTn assay used during Phase A (40 ng/L) is the 10% CV level and was recommended by guidelines and experts at that time.[2,13] In the meantime, some hospitals mainly in the USA, where hs-cTn assay are still not available, have lowered the cut-off level from 40 to 10 ng/L in order to better reflect the 99th percentile without fulfilling the criteria of 10% CV. For hospitals using a clinical decision level lower than the one used in Phase A (40 ng/L), any concerns about a systematic detrimental effect regarding coronary angiography should be even smaller. However, also the beneficial effects on time to discharge and exercise testing could be smaller than observed in our trial.

Rates of patients referred to coronary angiography in our data set are similar to those observed in a recent international diagnostic chest pain study performed on three continents including sites in