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 Emergency Medicine Journal Club
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P: In chest pain observation unit patients
I: Does the use of an expedited (i.e. 4 hour) serial cardiac enzyme determination
C: Compared to 6 hour measurements
O: Result in lower predictive value and/or patient safety.

Clinical Scenario:

58 yo M presented to the ER with sub-sternal chest pain. The patient has a history of hypertension and hypercholesterolemia, but did some work around his garage this past weekend. His EKG is non-diagnostic, but he is being considered for ACS/AMI because of his age and risk factors. Initial cardiac enzymes are within normal limits. Your pre-test probability for AMI/ACS is low, but how long do you need to wait (6 hrs or earlier to get a second set of enzymes to be comfortable to rule out an ACS/.AMI and send the patient to the stress lab ?

Search Strategy: Pubmed:

Author, Date, Country	Patient Group	Study Type	Outcomes	Key Results	Limitations
Fesmire 2000, USA	578 chest pain pts whose baseline CK-MB and CTnI < 2x upper limit of nl, over 18 months, labs at 0 & 2h, 1.8h mean time from onset to ED	retrospective cohort	Sensitivities / adverse outcome Delta CK-MB (>1.5 ng/mL) 87.7%/56.7% Delta TnI (>0.2 ng/mL) 61.4%/42.3%	Combined: sensitivity 89.5%/61.9% Specificity 93.7%/95.0%	Retrospective, not all patients had 2h labs drawn (determined by ED MDs)
McCord 2001, USA	1024 pts originally included 817 pts c poss AMI (65 c AMI) CKMB @ 0, 1.5, 3, 9h	Prospective	Med time onset to ED 4.3h cTnI & myoglobin at 0 & 90 m NPV 99.6% & sens 96.7% (63/65) Myoglobin affected by inc Cr 0,1.5,3h Sen/Spec NPV/PPV Myo+CKMB 92.3/65.7 99.0/19.0 Myo+cTnI 96.9/53.1	Results at 3h same as 1.5h 85% abnormal myoglobin or troponin at admission; 96.9% abnormal at 90 min; 3% missed at 90 min	ROC analysis optimized to fit the data, Blood samples not taken for all pts

			99.5/15.2		
Ng 2001, USA	1285 VA pts who presented to ER with symptoms of cardiac ischemia Myo, cTnI, CKMB at 0, 30, 60, 90min Also at 3&6h to substantiate final dx of MI	Observational study of chest pain critical pathway	Sens/spec DM29/98 Myo70/80 CKMB74/96 cTnI86/99 T&dmyo99/98 T,MB,DM100/94 50% pts presented > 6hrs, 40% pts d/c home (0.2% returned with MI and 2% returned c unstable angina)	T,MB,DM 100% sens at 90m T,MB,DM identified 94% MIs at 90m	VA (98% male), >50% presented >6 hrs onset of chest pain, 5% incidence of infarction (due to referral)
Innes 2002, USA	5005 pt, 565 AMI, ongoing CP, nondx ECG; classified pain 0-4, 4-8, 8-12, >12h	Prospective	Sensitivity (pain 4 to >12hrs) CKMB 28-77% Myoglobin 39-73%	Single assays or serial markers at 0 & 1h in ED does not rule out AMI	Limited time points, multiple sites (10 US and 2 Canadian ED)
Christenson 2006, USA	769 pts c ant/lat CP at Urban Tertiary Care ED Cardiac markers 0 & 2h	Prospective, cohort study 123 variables screened	48 variable retained for algorithm 10% AMI 11% unstable AMI 98.8% sens, appropriate d/c of 32.5% pts	Clinical predication rule 98.8% sensitive, 32.5% specific	Single center, data during day and evening hours only, complex algorithm, unknown cost 2 separate data collection periods

Clinical Bottom Line: Multiple studies have looked at using cardiac markers to rule out AMI in patients less than 6 hours. A combination of cardiac markers, as well as changes in these markers, can be used with high sensitivity to rule out AMI. In Annals of Emergency Medicine (Fesmire 2006), their clinical policy stated that level B recommendations exist to exclude non ST-segment elevation AMI if:

1. Neg CKMB, TnI/TnT measured 8-12h after onset of chest pain
2. Neg myo c neg CKMB/Tn when measured at time 0 & 90min when presenting <8h after onset
3. Neg 2h delta CKMB c neg 2h delta Tn present <8h after onset

The data supports ruling out AMI in patients with negative serial/delta cardiac markers in less than 6 hours, but a RCT would help validate this data/practice. As always, clinical assessment and consideration of other variables (time of onset, etc) must be considered in practice.