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Implementation of rapid rule-out of myocardial infarction using high-sensitivity troponin: Cross sectional survey of English hospitals

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Abstract

Objectives: Recent guidance recommended use of high-sensitivity troponin for rapid rule out of myocardial infarction (MI) in the English health service. We aimed to determine the extent of implementation of this guidance across English hospitals.

Methods: Cross-sectional questionnaire survey of 131 English acute hospitals with over 10,000 admissions per year.

Results: We received 125/131 responses (95%), with 110/125 (88%) reporting use of a high-sensitivity troponin assay and responses showing progressive implementation over the last ten years. High-sensitivity troponin was reported to be used for rapid rule out of MI in 92/110 Trusts (84%). Review of guidelines received from 95/110 Trusts identified that 71/95 (75%) provided guidance for rapid MI rule out with high-sensitivity troponin: 57 recommended testing at zero and three hours, four recommended testing at zero and two hours, nine recommended testing at zero and one hour, and timing was unclear at one Trust.

Conclusions: English acute hospital Trusts report widespread implementation of high-sensitivity troponin for rapid MI rule out with most recommending testing at zero and three hours.

What is already known

- High-sensitivity troponin can be used to rule out MI within a few hours of arrival at hospital
- Recent guidance recommends using high-sensitivity troponin to rule out MI in the English health service

What this paper adds

- English acute hospital Trusts report widespread implementation of high-sensitivity troponin for rapid MI rule out
- Most hospitals providing guidelines recommended testing at zero and three hours

Background

Emergency admissions (requiring provision of a hospital bed) to English hospitals with unspecified chest pain increased from 118,828 in 1998-9 to a peak of 248,197 in 2010-11 before falling to 232,598 in 2017-18 (1). The most likely reason for admission for these cases is to rule out myocardial infarction (MI). The recent development of high-sensitivity troponin assays offer the potential to allow rapid rule out of MI and thus reduce admissions with chest pain. In 2014 new guidance from the National Institute for Health and Care Excellence (NICE) recommended using high-sensitivity troponin assays to rule out MI within three hours of hospital attendance (2), which was incorporated into updated NICE chest pain guidance in 2016 (3). We aimed to determine whether NICE guidance regarding the use of high-sensitivity troponin to rule out MI has been implemented across English hospitals.

Methods

We conducted a survey of all acute NHS hospital Trusts in England with more than 10,000 emergency admissions in the year 2017/2018, excluding children's and maternity hospitals (1). We sent a short questionnaire through email and online forms via a freedom of information (FOI) access request to 131 eligible Trusts in April 2019. The questionnaire was designed to be completed with minimal time and effort, using readily available information, and is shown in appendix 1. The questionnaire was sent to the FOI administrator but it was not possible to determine who subsequently provided the information. Trust guidelines or protocols were reviewed to determine the timing of troponin sampling and whether troponin measurements were used to rule out MI within four hours of hospital admission. This was determined by the

last sample being no later than three hours from hospital arrival or initial sampling to allow for time taken to take blood and retrieve results.

Results

We received 125/131 (95%) responses between April and August 2019, with 110 (88%) reporting use of a high-sensitivity troponin assay. Figure 1 shows the number of Trusts introducing the assay per year (excluding three that did not respond to this question), indicating progressive implementation over the last ten years. Around half implemented high-sensitivity assays before the 2014 NICE guidance and half after.

The assay used was manufactured by Roche in 63/110 (57%) Trusts, Abbott in 16 (14%), Beckman Coulter in 12 (11%) and Siemens in 12 (11%), with one Trust using both Roche and Abbott assays and six (5%) not responding to this question. It is worth noting that the NICE guidance only recommended the Elecsys Troponin T high-sensitive assay (Roche) and the ARCHITECT STAT High Sensitive Troponin- I (Abbott) for clinical use, while the AccuTnI +3 assay (Beckman Coulter) was only recommended for clinical research. The threshold for positivity was reported by 97/110 Trusts, with 79 using the 99th percentile (54 sex-specific, 25 overall), 12 using a higher threshold and six using a lower threshold, of which three appeared to be the Limit of Detection.

High-sensitivity troponin was reported to be used for rapid rule out of MI in 92/110 Trusts (84%), with one additional Trust reporting use for rule out in only one of its two sites. We received copies of guidelines from 95/110 Trusts. Review of the guidelines identified 71/95 (75%) using high-sensitivity troponin for rapid MI rule out: 57 recommended testing at zero and

three hours, four recommended zero and two hours, nine recommended zero and one hour, and timing was unclear at one Trust.

Discussion

English acute hospital Trusts report widespread use of high-sensitivity troponin for rapid rule out of MI, suggesting that recent NICE guidance has been widely implemented. Most hospitals use high-sensitivity troponin and most of these use it for rapid MI rule out. The most commonly used assay is the Roche high-sensitivity troponin T. Timing of sampling varies, with most Trusts recommending sampling at zero and three hours, but some recommending shorter time intervals. The findings suggest that availability of high-sensitivity troponin has increased since a survey of 94 hospital laboratories in 2015 reported that 60% had implemented a high-sensitivity troponin assay (4). A recent international survey reported that 72% of 80 UK sites use high-sensitivity troponin, with serial sampling at 3-6 hours in 78% (5). Our findings report a slightly higher use of high-sensitivity troponin (88%) across a larger and potentially more representative sample, with additional detail regarding timings and assays used.

The survey has strengths and limitations. The response rate was high, facilitated by the FOI request and simple design, thus ensuring a comprehensive sample of English Trusts. A disadvantage of this approach is that we were unable to specify or determine who completed the survey. It is limited to England, so it is unclear whether similar uptake of high-sensitivity troponin testing has occurred in the devolved nations of the United Kingdom. It describes reported practice rather than actual practice, so it is unclear whether the guidance presented is actually followed.

The last point is probably the most salient. Our survey suggests progressive implementation of NICE guidance across the English NHS that may be reflected in admission rates for chest pain, which have plateaued and started to fall after showing a progressive rise prior to implementation of high-sensitivity troponin (1). However, NICE guidance anticipated that implementation would lead to markedly reduced admissions, which is not yet obvious from routinely available data. It has been suggested elsewhere (6) that high-sensitivity troponins could lead to over-diagnosis and over-investigation. Further research could explore whether implementation of high-sensitivity troponin testing at different times across different Trusts over the last decade is associated with an effect on admissions with chest pain.

As noted in the results, NICE did not recommend the Beckman-Coulter assay as a high sensitivity assay and Seimens have only recently released a high sensitivity assay. The 22% of Trusts reporting use of these assays may therefore not have genuinely been using a high sensitivity assay.

In conclusion, English acute hospital Trusts report widespread implementation of high-sensitivity troponin for rapid MI rule out with most recommending testing at zero and three hours.

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Contributors

SG conceived the study. SG and RW designed the study. ST collected and analysed the data. ST wrote the first draft. All authors contributed to redrafting and approved the final draft.

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Competing interests

None

References

1. Hospital Admitted Patient Care Activity, 2017-18 - NHS Digital [Internet]. [accessed 29/08/2019]. Available from: https://digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity/2017-18
2. National Institute for Health and Care Excellence. Diagnostic Guideline (DG15). Myocardial infarction (acute): Early rule out using high-sensitivity troponin tests (Elecsys Troponin T high-sensitive, ARCHITECT STAT High Sensitive Troponin-I and AccuTnI+3 assays). 2014.
3. National Institute for Health and Care Excellence. Clinical Guideline (CG95): Chest pain of recent onset: assessment and diagnosis. 2016.
4. McKeeman GC, Auld PW. A national survey of troponin testing and recommendations for improved practice. Annals of clinical biochemistry 2015;52:527-42.

5. Anand A, Shah ASV, Beshiri A, Jaffe AS, Mills NL, Global Adoption of High-Sensitivity Cardiac Troponins and the Universal Definition of Myocardial Infarction. Clin Chem. 2019;65:484-489.
6. Mariathas M, Allan R, Ramamoorthy S, Olechowski B, Hinton J, Azor M et al. True 99th centile of high sensitivity cardiac troponin for hospital patients: prospective, observational cohort study BMJ 2019; 364 :729.