NICE National Institute for Health and Care Excellence

Adoption support resource – insights from the NHS

Implementation support

Published: 26 September 2019
www.nice.org.uk

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Contents

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Introduction

This **adoption resource** has been compiled by the NICE adoption and impact team working with Roche Diagnostics Limited for the Accelerated Access Collaborative (AAC). It has been developed to provide practical information and advice to sites (NHS organisations) on adopting high-sensitivity troponin tests with early rule-out protocols. These would help to rule out non-ST-segment-elevation myocardial infarction (NSTEMI) quickly in people presenting to an emergency department with chest pain suspected to be caused by acute coronary syndrome.

The AAC is a unique partnership bringing together leaders from across the healthcare landscape. This includes government, NHS, industry and patient representatives. The AAC aims to drive the uptake and adoption of innovation within the health and care system by identifying and supporting the best new innovations that will be most promising for patients.

The AAC is supporting the rapid uptake of 7 high-potential technology areas with full evidence bases already within the system. These products will enable patients to access new treatments faster and improve patients' lives but are not currently available to everyone who could benefit.

One of the technology areas selected is high-sensitivity cardiac troponin testing for early rule out of NSTEMI. This adoption resource forms part of the overall AAC implementation toolkit for this workstream.

The information in this document is based on the experiences of healthcare professionals working in 5 trusts in England and input from the National External Quality Assurance Service cardiac markers scheme.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Key points

In 2017–18 cardiac conditions were responsible for over half a million emergency department attendances per year in England. There are around 75,000 emergency admissions annually for heart attack.

Cardiac troponin I and cardiac troponin T are biological markers that are released into the circulation when cardiac muscle is damaged. Troponins I and T are the recommended biomarkers for diagnosing myocardial infarction in NICE's guideline on chest pain of recent onset. It can take up to 12 hours after a heart attack for troponin levels to rise significantly.

Using non-high-sensitivity versions of the troponin assays can mean a prolonged stay in hospital and multiple blood tests to safely rule out non-ST-segment-elevation myocardial infarction (NSTEMI). High-sensitivity troponin assays were developed to detect troponin in the blood at lower levels than non-high-sensitivity troponin assays. Using the high-sensitivity assays as part of an early rule-out protocol can reduce time to discharge.

NICE's diagnostics guidance on early rule out of myocardial infarction recommends 2 high-sensitivity troponin assays as options for the early rule out of NSTEMI in people presenting to an emergency department with chest pain and suspected acute coronary syndrome.

The assays are recommended for use with early rule-out protocols. The protocols typically include taking a blood sample for cardiac troponin I or T at initial assessment in an emergency department and taking a second blood sample after 3 hours. Laboratories should report absolute values and the upper reference limit should be set at the 99th percentile. Results should be interpreted along with clinical judgement and the results of clinical assessment. Healthcare professionals should take into account:

- the pre-test probability of NSTEMI
- the length of time since the suspected acute coronary syndrome
- the possibility of chronically elevated troponin levels in some people and
- that 99th percentile thresholds for troponin I and T may differ between sexes.

When NSTEMI is not excluded using an early rule-out protocol, further clinical assessment is needed to determine whether a diagnosis of NSTEMI is appropriate.

NICE's guideline on chest pain of recent onset includes the diagnostics guidance recommendations.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

It also recommends that, for people at low risk of myocardial infarction, if the result of the high-sensitivity troponin test taken at initial assessment is below the lower limit of detection, a single test may only be required to rule out NSTEMI.

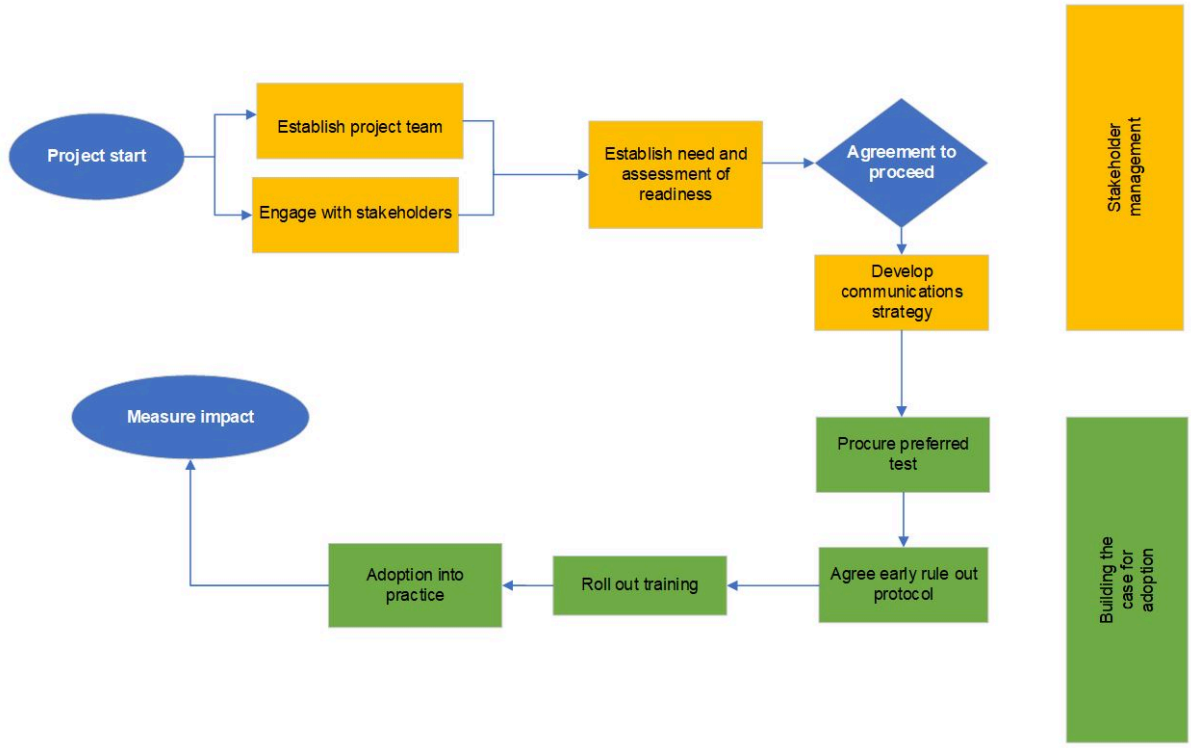
The 2015 European Society of Cardiology guidelines on the management of acute coronary syndromes take the time since pain onset into account. They note that the 0 h/1 h algorithm (0 h and 1 h refer to the time in hours from the first blood test) is an alternative to 0 h/3 h when high-sensitivity cardiac troponin assays with a validated algorithm are available and that the cut-off levels within the 0 h/1 h algorithm are assay specific.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Overview of the implementation process

Adoption will take a tailored approach based on the local context of the site. Below is a suggested outline process for adopting high-sensitivity troponin testing for early rule out of non-ST-segment-elevation myocardial infarction (NSTEMI), which has been developed based on the experience of healthcare professionals contributing to this adoption resource.

Figure 1 Outline implementation process for high-sensitivity troponin testing



Step 1: Stakeholder engagement

Establish a project team

A local project team will be able to work together to develop the implementation process and manage the changes to practice needed. This could be an established chest pain working group with experience in implementing other pathways and protocols or a newly formed group.

Identify the project leads:

- A clinical project champion. Someone with an interest and enthusiasm to learn more about using high-sensitivity troponin assays for early rule out of NSTEMI and who is familiar with the relevant guidance and evidence.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

- Project lead or manager who will be accountable for delivery.
- Project or management sponsor who will be able to help assess the financial viability of the project, ensure a business case is produced and help to show the potential cost savings.

Project team members are likely to include:

- cardiologists
- chest pain nurse specialists
- emergency department doctors and senior nurses
- clinical biochemists
- doctors from the acute medical team.

Wider engagement of stakeholders

In addition to the stakeholder groups already represented on the local project team, engagement and agreement on the planned changes should be sought from:

- clinical directors
- healthcare professionals working in the emergency department, acute medical units, cardiology and hospital laboratories
- directorate operational and finance management
- pharmacists
- commissioners.

Use for example: meetings, presentations and sharing copies of protocols, to secure support by communicating the benefits and reasons for adoption.

Step 2: Assessment of readiness

Questions the project team should consider when building the case for adoption and developing the implementation process are:

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Current demand

- How many people present to the emergency department with chest pain suspected to be caused by an acute coronary syndrome?
- What percentage are discharged following rule out of NSTEMI and what is their length of stay?
- How many people is the technology suitable for (consider selection criteria, contraindications)?

Laboratory

- Does the hospital laboratory have access to high-sensitivity troponin assays with the current service contract in place?
- Which manufacturer currently provides the biochemistry platforms? Do they offer NICE-recommended high-sensitivity troponin assays?
- When will the hospital laboratory be tendering for new equipment?

Care pathway mapping

- What is the current care pathway? What actually happens? Where do people wait for troponin results? Who is involved (decision making, doing tasks)?
- What are the current follow-up care and onward referral arrangements?
- What is the potential effect on other specialities, for example medical admissions and cardiology, of adopting early rule-out protocols for NSTEMI using high-sensitivity troponin assays?
- Do we know of any other sites who have done this or are planning it? How do we learn from them? Can we coordinate adoption with any local sites?

Cost

- What are the anticipated costs and savings from adoption?
- Is a business case needed and who is best placed to support this at a senior level and help overcome any financial barriers?

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Measuring impact

- What data do we currently collect for people presenting with chest pain suspected to be caused by an acute coronary syndrome?
- Who is currently responsible for collecting these data?

Step 3: Develop a communications strategy

There may be uncertainty among stakeholders about the diagnostic accuracy of ruling out NSTEMI in a shorter time than before. There may also be concerns that using a higher-sensitivity cardiac troponin assay will increase workload because of inappropriate testing and inaccurate interpretation. It is important to share the potential benefits with stakeholders using methods tailored approaches:

- Depending on current local pathways, there could be fewer admissions for people with chest pain suspected to be caused by an acute coronary syndrome who are waiting for troponin results. It is estimated that following adoption, between a quarter and a third of people who would have previously been admitted can be discharged.
- There could be a shorter stay in the emergency department for people when an acute myocardial infarction is ruled out.
- There would be more appropriate referrals and onward follow up from the emergency department to other services such as the rapid access chest pain clinic.
- There would be more rapid identification of NSTEMI, leading to quicker decisions on the next steps in the person's care.
- There could be fewer referrals to cardiology from the emergency department for people with chest pain suspected to be caused by an acute coronary syndrome. Note there may be an increase in referrals for people who need further investigation and treatment.

Step 4: Procurement and set up of the preferred test

NICE has assessed 3 assays which measure cardiac troponin levels in the blood, to help the NHS decide whether to use these products. The assays are called Elecsys Troponin T High Sensitive (Roche Diagnostics), ARCHITECT STAT High Sensitive Troponin-I (Abbott Diagnostics) and AccuTnI+3 (Beckman Coulter).

The Elecsys Troponin T High Sensitive and ARCHITECT STAT High Sensitive Troponin-I assays are

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

recommended by NICE, alongside other investigations, to help doctors in emergency departments work out whether people with chest pain thought to be caused by a heart problem are likely to be having a heart attack or not. The AccuTnI+3 assay was only recommended for use in clinical research, for early rule out of NSTEMI in people presenting to an emergency department with chest pain and suspected acute coronary syndrome.

Roche Diagnostics - Elecsys Troponin T high-sensitive assay: is designed for use in a laboratory setting and can be used on the Roche Elecsys 2010 analyser and the cobas Modular Analytics e-series immunoassay analysers. The Elecsys test is a sandwich electrochemiluminescence immunoassay, and is intended for the in vitro quantitative determination of troponin T in serum and plasma samples. The Elecsys Troponin T high-sensitive assay has an estimated turnaround time of 18 minutes. The manufacturer states that the Elecsys assay can detect troponin T in 61% of the reference population and has a recommended 99th percentile cut-off of 14 nanograms/litre, with a coefficient of variation or imprecision of less than 10%. The assay is CE-marked and available to the NHS.

Abbott Diagnostics - ARCHITECT STAT High Sensitive Troponin-I assay: is designed for use in a laboratory setting and can be used with the Abbott ARCHITECT i2000SR and i1000SR analysers. The assay is a chemiluminescent microparticle immunoassay and is intended for the in vitro quantitative determination of cardiac troponin I in serum and plasma samples. Results are available within 16 minutes. The manufacturer states that the ARCHITECT STAT High Sensitive Troponin-I assay can detect troponin I in 96% of the reference population, and has a recommended 99th percentile cut-off of 26.2 nanograms/litre, with a coefficient of variation of 4%. The manufacturer's instructions for use also states a 99th percentile cut-off of 34.2 nanograms/litre for men and 15.6 nanograms/litre for women. The assay is CE-marked and available to the NHS.

The International Federation of Clinical Chemistry and Laboratory Medicine committee on clinical applications of cardiac bio-markers has produced a high sensitivity cardiac troponin I and T assay analytical characteristics document for all assays claimed by manufacturers to be high sensitivity.

Laboratories without access to high-sensitivity cardiac troponin assays through their managed service contract should ask their provider if there is scope to access these tests. Some contracts may state that when a test is clinically needed it can be sourced from another provider. Service contracts are renewed regularly, therefore this could be a consideration in the tendering process for a new contract.

Laboratories should adhere to their usual quality assurance and validation processes when adopting high-sensitivity cardiac troponin assays in line with the UK accreditation service (UKAS),

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

which includes checking if there are differences in results from all their platforms used to run the high-sensitivity cardiac troponin assays.

Before adoption, laboratories should validate the assay at different values including the rule-out cut off. This is particularly important because the sensitivity of the assay means that only small changes influence clinical actions. Findings should be used to inform the cut-off values and thresholds for developing the clinical protocol and give reassurance and confidence to stakeholders about the benefits of adoption.

Both assays can be used for serum and plasma samples, but it is suggested that the same sample type should be used when serially testing samples from the same patient. Ongoing internal quality assurance will be required in line with UKAS. Sites should be signed up to a UKAS-accredited external quality assessment scheme. Quality assurance checks should be done at or near clinical decision points. This is commonly at the limit of detection and 99th percentile, as a minimum.

Sourcing internal quality assurance samples with a low concentration of troponin can be challenging because producing such samples, at scale, can be technically difficult. Suggested solutions include developing samples in house and identifying third-party providers who can offer this. As with all internal quality assurance materials, sites will need to purchase the samples. Because of the difficulty in getting low concentration samples this can be an additional cost for some laboratories compared with other assays.

It is important for everyone involved to know which manufacturer's test is being used and the specific pathway that is being followed, because the cut offs for the 2 assays are not interchangeable.

Step 5: Agree an early rule-out clinical protocol

There is no nationally recommended protocol with thresholds and cut-off values for early rule out of NSTEMI using high-sensitivity cardiac troponin assays in England. The NICE diagnostics guidance on early rule out of NSTEMI using high-sensitivity troponin assays recommends a 2-test strategy, typically on admission and at 3 hours. However, the committee concluded that there was insufficient evidence to recommend a specific test strategy and agreed that early rule-out protocols should be chosen according to local preference.

Sites should use relevant guidance including the European Society of Cardiology's guidelines on the fourth universal definition of myocardial infarction, in addition to their own validation testing to agree a local protocol. Considerations should include:

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

- Whether nanograms/litre will be used as the unit of measure for reporting, as recommended by expert opinion.
- Whether the upper reference limit should be set at the 99th percentile and if this will be used to support decision making in the early rule-out pathway.
- Whether the limit of detection will be used to support decision making in the pathway.
- What evidence-based high-sensitivity cardiac troponin assay result is acceptable for discharge (assuming there are no other reasons for admission).
- What change in troponin values between the 2 tests should warrant further investigation or no further action (a rise or fall in troponin levels can indicate cardiac muscle damage).
- Whether results will be reported in whole numbers or to 1 decimal place. How this will affect patient care if the result is near a threshold or a change in troponin is detected.
- What risk stratification tools will be used and how the results will influence the high-sensitivity cardiac troponin testing strategy.
- How the time since pain onset will affect the testing strategy used.
- Whether the protocol still allows and encourages clinical judgement (chest pain management cannot be entirely protocol driven).

  It is important to note that the limit of detection will vary between manufacturers. Also, the 99th percentile thresholds for troponin I and T will differ between manufacturers and may differ between sexes.

Sites reported using a small implementation team or a specialist subgroup initially to develop and agree a local protocol and then sought wider agreement from stakeholders.

If trusts can work together to agree a protocol across a locality or region this will make treatment more consistent. The Liverpool acute chest pain care pathway is an example of this.

Step 6: Training

Staff training, education and awareness raising is crucial to ensure that the benefits of high-sensitivity cardiac troponin assays for early rule out of NSTEMI are optimised. Education efforts should target emergency department, acute medicine, cardiology and laboratory staff. Outreach can take the form of presentations at team meetings, junior doctor inductions, study days, training

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

sessions, and targeted emailing to staff.

Training at the point of implementation and regular ongoing updates should include:

- Patient selection: The person responsible for deciding who the test should be requested for should be skilled in patient selection to minimise the risk of inappropriate requests.
- Blood-taking techniques: Haemolysed samples give false high-sensitivity cardiac troponin results. This could cause delays. Blood collection tube manufacturers may be able to support this training.
- Interpretation: High-sensitivity cardiac troponin results are interpreted differently from non-high-sensitivity cardiac troponin results. They should not be interpreted and acted on in isolation but after a holistic clinical assessment.

Step 7: Adoption into practice

To realise the benefits of using high-sensitivity cardiac troponin assays for early rule out of NSTEMI, sites will need a change in service delivery to integrate the early rule-out protocol into current hospital systems. Consider:

- Whether any new documentation is needed (protocols, flow charts, referral forms).
- Identifying who will be responsible for requesting the high-sensitivity cardiac troponin assay. Usually this is the emergency department and acute medicine doctors and nurse practitioners.
- Ensuring the assays are done only when appropriate.
- Ensuring the initial blood sample is taken as soon as the protocol indicates.
- Ensuring there is capacity for people to wait in an appropriate allocated location for the results and for a second blood sample to be taken, ideally avoiding a formal admission to the hospital. Can an ambulatory care environment be used with chairs rather than beds?
- Ensuring the second sample is taken as soon as it is due to prevent delays. This may be before the initial test results are available. Clear documentation and handover sheets can help.
- Putting a system in place to ensure that relevant staff are aware of a result as soon as it is available. Delays at this stage are common.
- Agreeing who will be responsible for decision making based on the results. This is usually senior doctors in the emergency department, cardiology or acute medicine. Some sites have

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

- recruited chest pain nurses who advise the emergency department on interpreting troponin results in complex situations.
- Identifying how the testing protocol will affect patient flow and workload.
- Establishing discharge and onward referral arrangements, which could include:
    - when nurse-led discharge protocols could be used
    - acute chest pain referral pathways to acute medicine for patients who meet certain criteria
    - clear agreements with cardiology, including nurse specialists, about when to review patients if they meet certain criteria
    - adaptation of the referral pathway for rapid access chest pain clinics to take patients who meet defined criteria.
- Developing discharge information sheets for patients and their GPs, or ensuring enough information is added to the emergency department GP discharge letter, to clarify what tests have been done and what they mean. This could prevent workload associated with follow-up enquiries.
- Identifying any changes needed in laboratory processes to achieve a turnaround time from the sample arriving in the laboratory to a result at 1 hour.

Step 8: Measurement

It is important to take measurements before, during and after adopting the technology to ensure implementation has been successful. The systems and processes for how data will be collected and reported must be agreed and someone given overall responsibility. Consider whether the data could be shared with regional and national data collection systems to support ongoing refinement of protocols.

Monitoring performance

These audit measures are suggested to monitor compliance with using local early rule out of NSTEMI protocols with high-sensitivity troponin assays:

- High-sensitivity cardiac troponin assays are done in line with the local protocol.
- Patients on a pathway for early rule out of NSTEMI are assessed for their risk of myocardial

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

- infarction (as indicated by a validated tool).
- Patients have a sample taken to measure troponin within a locally agreed time period, in line with the timings recommended by the protocol.
- Turnaround times in the laboratory from sample receipt (or sample collection if agreed locally) to availability of the result within 1 hour. This is in line with suggested key performance indicators from the Royal College of Pathologists linked to patient pathways and emergency department blood sciences turnaround times.

Measuring impact

There are several suggested measures which could assess impact:

- For people with chest pain suspected to be caused by an acute coronary syndrome, time spent in the emergency department.
- Transit times for people going through the emergency department on the acute coronary syndrome rule out pathway.
- Incidence of readmission of people with troponin-positive acute coronary syndrome within 30 days following the low-risk rule-out pathway.
- Admission rates for chest pain suspected to be caused by an acute coronary syndrome (suggested ICD10 code: R07) when the early rule-out protocol is in place.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Potential barriers to implementation and mitigating action

Table 1 summarises the key barriers to adoption gathered from the experiences and learning of contributors to this resource.

Table 1 Summary of the key barriers to adoption

Challenge	Suggested actions
Access to a recommended high-sensitivity troponin assay	Clinical biochemistry departments: • actively engage with emergency departments to share the benefits of high-sensitivity troponin assays if these are available • explore how to source recommended high-sensitivity troponin assays if these are not available. Check contracts for allowances for new tests when there is a clinical need • include the benefits of high-sensitivity troponin assays when tendering for service contracts.
Agreement between emergency department, cardiology, clinical biochemistry and acute medicine about the most appropriate early rule-out protocol	• Identify a clinical champion with an interest in using high-sensitivity troponin assays for early rule out of non-ST-segment-elevation myocardial infarction (NSTEMI), to engage colleagues in adoption. • Form a specialised implementation team to draft the early rule-out protocol. This will be a small group of senior representatives from the emergency department, cardiology, clinical biochemistry and acute medicine. • Use information from local validation testing of the assay and protocol to secure support from stakeholders.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Inappropriate testing reduces clinical confidence in the test	• Use clear protocols defining which patients' high-sensitivity troponin assays should be used for the early rule out of NSTEMI. • Organise ongoing training and updates for staff responsible for ordering the test and record training. • Regularly audit practice against local guidance on who the assay should be requested for.
Allocation of resources	• Work with trust finance staff to support any necessary business cases and redistribution of resources when needed. • Factor into finance planning that anticipated savings will be seen in emergency department, cardiology and acute medicine through quicker discharge. Costs are likely to be incurred by the laboratory for the assay and consumables and staff costs for the quality assurance work.
Measuring the impact of adoption	• During adoption planning, identify the measures of success and agree who will be responsible for collecting and reporting this information. Agree how the information will be used.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Resources

Table 2 details resources that could be used to support the case for adoption locally.

Table 2 List of resources

Resource	How this could support the case for adoption locally
NICE's guideline on chest pain of recent onset	Section 1.2.5: Use of biochemical markers for diagnosis of an acute coronary syndrome. National guidance provides assurance of the evidence base supporting the change in practice.
NICE's diagnostics guidance on myocardial infarction (acute): early rule out using high-sensitivity troponin tests	National guidance provides assurance of the evidence base supporting the change in practice.
European Society of Cardiology (2015) guidelines on acute coronary syndromes in patients presenting without persistent ST-segment elevation	International guidance provides assurance of the evidence base supporting the change in practice.
The association for clinical biochemistry and laboratory medicine (2019) national audit	Indicates current practice and allows benchmarking.
The clinical audit tool for NICE's diagnostics guidance on myocardial infarction (acute): early rule out using high-sensitivity troponin tests	Tool to collect information on the time taken to rule out non-ST-segment-elevation myocardial infarction (NSTEMI) in clinical practice and on the clinical outcomes of people presenting to an emergency department with chest pain and suspected acute coronary syndrome.
International Federation of Clinical Chemistry and Laboratory Medicine's resources from the committee on clinical applications of cardiac biomarkers	Online resources and publications to support adoption of high-quality testing locally.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Hospital episodes statistics (HES) data for accident and emergency activity	Provides high-level data including the number of patients admitted for cardiac conditions. More detailed data would need HES data extraction.
NHS England's A&E attendances and emergency admissions	Includes data on the number of patients discharged, admitted or transferred within 4 hours of arrival. Could be used locally to identify a need to reduce emergency department waiting times.
Januzzi JL et al. (2019) Recommendations for Institutions Transitioning to High-Sensitivity Troponin Testing. Journal of the American College of Cardiology 73 (9): 1059–77	Provides prompts for sites to consider when planning adoption of an early rule-out protocol.
AHSN/Peninsula Collaboration for Health Operational Research and Development (PenCHORD) project – Cardiac troponin: diagnosing heart attacks in A&E	This project and associated report explores the potential impact on heart attack care pathways in the South West, if high-sensitivity troponin assays are implemented consistently. The content could be used for developing business cases locally and planning adoption.
Ambavane A et al. (2017) Economic evaluation of the one-hour rule-out and rule-in algorithm for acute myocardial infarction using the high-sensitivity cardiac troponin T assay in the emergency department. PLOS ONE 12(11): e0187662	May help support the development of a business case locally.
NHS England Innovation and Technology Payment (ITP) 2019/20 – High sensitivity troponin assay in a rapid rule out protocol for acute myocardial infarction	Website information and technical notes can be used in developing a business case and planning adoption to ensure ITP payments are directed locally.
Thygesen K, Alpert JS, Jaffe AS et al. (2019) Fourth universal definition of myocardial infarction (2018) European Heart Journal 40 (3): 237–269	Provides information and details about diagnosing myocardial infarction, which will be useful to teams developing clinical protocols.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Wu AHB, Christenson RH, Greene DN et al. (2018) Clinical Laboratory Practice Recommendations for the Use of Cardiac Troponin in Acute Coronary Syndrome: Expert Opinion from the Academy of the American Association for Clinical Chemistry and the Task Force on Clinical Applications of Cardiac Bio-Markers of the International Federation of Clinical Chemistry and Laboratory Medicine. Clinical Chemistry 64 (4): 645–655	Focuses on clinical laboratory practice recommendations for high-sensitivity troponin assays.
Risk scores: Emergency Department Assessment of Chest Pain score (EDACS) GRACE score GRACE 2 HEART score TIMI risk score T-MACS	These are not being presented as validated or approved tools. These are scoring systems contributors referred to during the development of this resource. Users should be aware of the risks and benefits of each tool as a prognostic stratification tool, to understand how the result can be used in clinical practice. The choice of tool should be considered in the context of the high-sensitivity troponin assay in use.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Clinical pathway and algorithms

Here are some examples of protocols and pathways developed by NHS services that can be used for developing local documents. They have been shared by contributors; they were not produced for, or commissioned by, NICE. These protocols were in use at the trust at the time of publication, however sites are reviewing and updating these on an ongoing basis.

- Aintree University Hospital NHS Foundation Trust: Liverpool acute chest pain care pathway
- North Bristol NHS Trust: Suspected acute coronary syndrome guideline
- Gloucestershire Hospitals NHS Foundation Trust: Cardiac chest pain pathway

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Implementation

Table 3 is a suggested implementation checklist which can be used locally to help guide the project team through the adoption process.

Table 3 Implementation checklist

Element	Checklist
Project start	Project leads identified: • clinical project champion • project lead or manager • project or management sponsor who will be able to help assess the financial viability of the project, ensure a business case is produced and help to show the potential cost savings.
	Key stakeholders identified: • cardiologists • chest pain nurse specialists • emergency department doctors and senior nurses • doctors from the acute medical team • clinical biochemists.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

	Other internal stakeholders identified: • pharmacists • healthcare professionals working in the emergency department, acute medical units, cardiology and hospital laboratories • operational and finance management • clinical directors • commissioners.

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Assess readiness	**Current demand** • How many people present to the emergency department with chest pain suspected to be caused by an acute coronary syndrome? • What percentage are discharged following rule out of non-ST-segment-elevation myocardial infarction (NSTEMI) and what is their length of stay? • How many people is the technology suitable for (consider selection criteria, contraindications)? **Laboratory** • Does the hospital laboratory have access to high-sensitivity troponin assays with the current service contract in place? • Which manufacturer currently provides the biochemistry platforms? Do they offer NICE-recommended high-sensitivity troponin assays? • When will the hospital laboratory be tendering for new equipment? **Care pathway mapping** • What is the current care pathway? What actually happens? Where do people wait for troponin results? Who is involved (decision making, doing tasks)? • What are the current follow-up care and onward referral arrangements? • What is the potential effect on other specialities, for example medical admissions and cardiology, of adopting early rule-out protocols for NSTEMI using high-sensitivity troponin assays? • Do we know of any other sites who have done this or are planning it? How do we learn from them? Can we coordinate adoption with any local sites? **Cost** • What are the anticipated costs and savings from adoption?

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

	• Is a business case needed and who is best placed to support this at a senior level and help overcome any financial barriers? **Measuring impact** • What data do we currently collect for people presenting with chest pain suspected to be caused by an acute coronary syndrome? • Who is currently responsible for collecting these data?
Agreement to proceed	• Business case developed and submitted? • Agreement to proceed based on value proposition?
Developing communications plans	• Internal stakeholders engaged?
	• External stakeholders engaged?
Identify preferred assay	• Engagement with manufacturers? • Service contracts discussed? • Assay validation checks completed? • Engaged with UKAS accredited external quality assurance service and internal and external quality assurance programme agreed? • Quality assurance samples for (internal quality assurance) containing low levels of troponin sourced?

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Agree clinical pathway	• Timings of troponin tests agreed? • Cut-off thresholds and delta changes agreed? • Risk scoring tool to support decision making selected? • Criteria for onward referrals agreed? • Pathway agreed across a region or locality?
Roll out training	• Champion responsible for ensuring training for relevant staff groups? • Trainers identified? • Spread of training monitored?
Adoption into practice	• Staff groups with responsibility for requesting high-sensitivity troponin assays identified? • Staff groups with responsibility for acting on high-sensitivity troponin assay results identified? • Strategies adopted to ensure blood tests are taken as soon as the protocol indicates? • Suitable location agreed for patients to wait for tests and results? • Discharge and onward referral protocols or criteria agreed?
Monitor performance	• Audit lead identified? • Audit standards and audit plan written?
Measure impact	• Agreement of service level measures to show impact on practice?

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Contributors

Cara Afzal
Senior programme development lead, Health Innovation Manchester

Dr Tarek Antonios
Consultant in cardiovascular and general medicine, St George's University Hospitals NHS Foundation Trust

Dr Shahid Aziz
Consultant cardiologist, North Bristol NHS Trust

Peter Beresford
Clinical biochemist, North Bristol NHS Trust

Professor Rick Body
Consultant in emergency medicine, Manchester University NHS Foundation Trust

Professor Paul Collinson
Consultant chemical pathologist and professor of cardiovascular biomarkers, Clinical Blood Sciences, St George's University Hospitals NHS Foundation Trust

Professor Edd Carlton
Consultant emergency physician, North Bristol NHS Trust

Jenny Deane
Cardiac chest pain specialist nurse, Gloucestershire Hospitals NHS Foundation Trust

Professor Steve Goodacre
Professor of emergency medicine, University of Sheffield

Alison Halliday
Specialist nurse cardiology, Gloucestershire Hospitals NHS Foundation Trust

Sam Holker
Cardiac specialist nurse, North Bristol NHS Trust

Dr Jason Kendall

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).

Consultant emergency physician, North Bristol NHS Trust

Dr Aleem Khand
Consultant interventional cardiologist, Liverpool Heart and Chest Hospital and Aintree University Hospital NHS Foundation Trust

Stuart Monk
Associate director of delivery, South West Academic Health Science Network

Adrian Oates
Lead biomedical scientist, North Bristol NHS Trust

Alan Reid
Scheme organiser, UK NEQAS Cardiac Markers

Emma Stevenson
Senior clinical biochemist, Gloucestershire Hospitals NHS Foundation Trust

Dr Sadie Thomas
Principal clinical biochemist, Gloucestershire Hospitals NHS Foundation Trust

This document has been developed using the template created for the Accelerated Access Collaborative by the AHSN Network.

ISBN: 978-1-4731-3544-4

© NICE 2019. All rights reserved. Subject to Notice of rights (https://www.nice.org.uk/terms-and-conditions#notice-of-rights).