

International use of Cardiac Biomarkers (Internal Testing)

Introduction

Thank-you for participating in the following survey which aims to explore the international use of biomarkers in the diagnosis of myocardial infarction.

This survey is being hosted by the University of Edinburgh on behalf of the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM), the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) and the Association for Acute CardioVascular Care (ACVC).

If you are interested in taking part, please select "Next" below.

Your participation is entirely voluntary, and you can withdraw at any time. By continuing with this survey you consent to the anonymous storage and use of survey responses by the above entities in accordance with General Data Protection and Regulation (GDPR) guidance.

Thank-you for your time and contribution.

Participant information

What country are you based in?

Which category best describes the clinical institution where you work?

- Centre providing local and regional care
- Centre providing local care only

Does the institution where you work perform on site angioplasty / percutaneous coronary intervention (PCI)?

- Yes
- No
- Don't know

What is the name of your clinical institution?

What is your speciality?

If you selected Other, please specify:

Are you a member of any of the following societies? *Optional*

- European Federation of Clinical Chemistry and Laboratory Medicine (EFLM)
- International Federation of Clinical Chemistry and Laboratory Medicine (IFCC)
- Association for Acute CardioVascular Care (ACVC)

Cardiac biomarkers at your institution.

Which of the following biomarkers are available in your institution to evaluate patients with suspected myocardial infarction? **(select all that apply)**

- Creatine Kinase-MB
- Troponin-T
- Troponin-I
- Myoglobin
- Copeptin

What is the **MAIN** cardiac biomarker used at your institution to evaluate patients with suspected myocardial infarction? **(select one)**

- Creatine Kinase-MB
- Troponin-T
- Troponin-I
- Myoglobin
- Copeptin

Cardiac biomarkers at your institution.

Which of the following biomarkers are available in your institution to evaluate patients with suspected myocardial infarction? **(select all that apply)**

Please select at least 1 answer(s).

- Creatine Kinase-MB
- Troponin-T
- Troponin-I
- Myoglobin
- Copeptin

What is the **MAIN** cardiac biomarker used at your institution to evaluate patients with suspected myocardial infarction? **(select one)**

- Creatine Kinase-MB
- Troponin-T
- Troponin-I
- Myoglobin
- Copeptin

Do you run internal quality control samples for troponin?

- Yes
- No
- Don't know

Do you perform external quality assessment or proficiency testing for troponin?

- Yes
- No
- Don't know

What is your laboratory turn around time for a cardiac troponin sample? The turn around time is the time interval from a sample arriving in the laboratory to the result.

- <30 minutes
- 30 - 59 minutes
- 60 - 89 minutes
- 90 - 119 minutes
- ≥120 minutes

Cardiac troponin use at your institution.

Which of the following types of troponin assay are available for clinical use at your institution? **(select all that apply)**

Please select at least 1 answer(s).

- Contemporary
- High Sensitivity
- Point of Care
- Don't know

What is the **MAIN** type of assay in use in the emergency department for the assessment of patients with suspected myocardial infarction? **(select one)**

- Contemporary
- High Sensitivity
- Point of Care
- Don't know

Contemporary troponin assays

Which contemporary troponin assay is in use at your institution?

Who is the assay manufacturer?

- Abbott
- Beckman
- Ortho
- Radiometer
- Roche
- Siemens
- Tosoh
- Don't Know
- Other

If you selected Other, please specify:

Which analysis platform is used?

If you selected Other, please specify:

High-sensitivity troponin assays

Which high-sensitivity troponin assay is in use at your institution?

Who is the assay manufacturer?

If you selected Other, please specify:

Which analysis platform is used?

If you selected Other, please specify:

Point of care assays

Which point of care troponin assay do you use?

Who is the assay manufacturer?

If you selected Other, please specify:

Which analysis platform is used?

If you selected Other, please specify:

The 99th centile

Do you use sex-specific 99th centile upper reference limits to diagnose myocardial infarction?

- Yes
- No
- Don't know

Do you know the troponin value used as the 99th centile upper reference limit in men and women?

- Yes
- No

What is the 99th centile upper reference limit used in **MALES**?

Please enter a number.

What is the 99th centile upper reference limit used in **FEMALES**?

Please enter a number.

Please specify the units used.

- ng/L
- µg/L
- Don't know

Do you know the troponin value used as the 99th centile upper reference limit?

- Yes
- No

What is the 99th centile upper reference limit?

Please specify the units used.

- ng/L
- µg/L
- Don't know

Diagnostic pathways for myocardial infarction

Does your institution use a documented structured pathway for the diagnosis of myocardial infarction?

- Yes
- No
- Don't know

Is this pathway based on a published or validated national or international pathway?

- Yes
- No
- Don't know

Biomarker use in diagnostic pathways

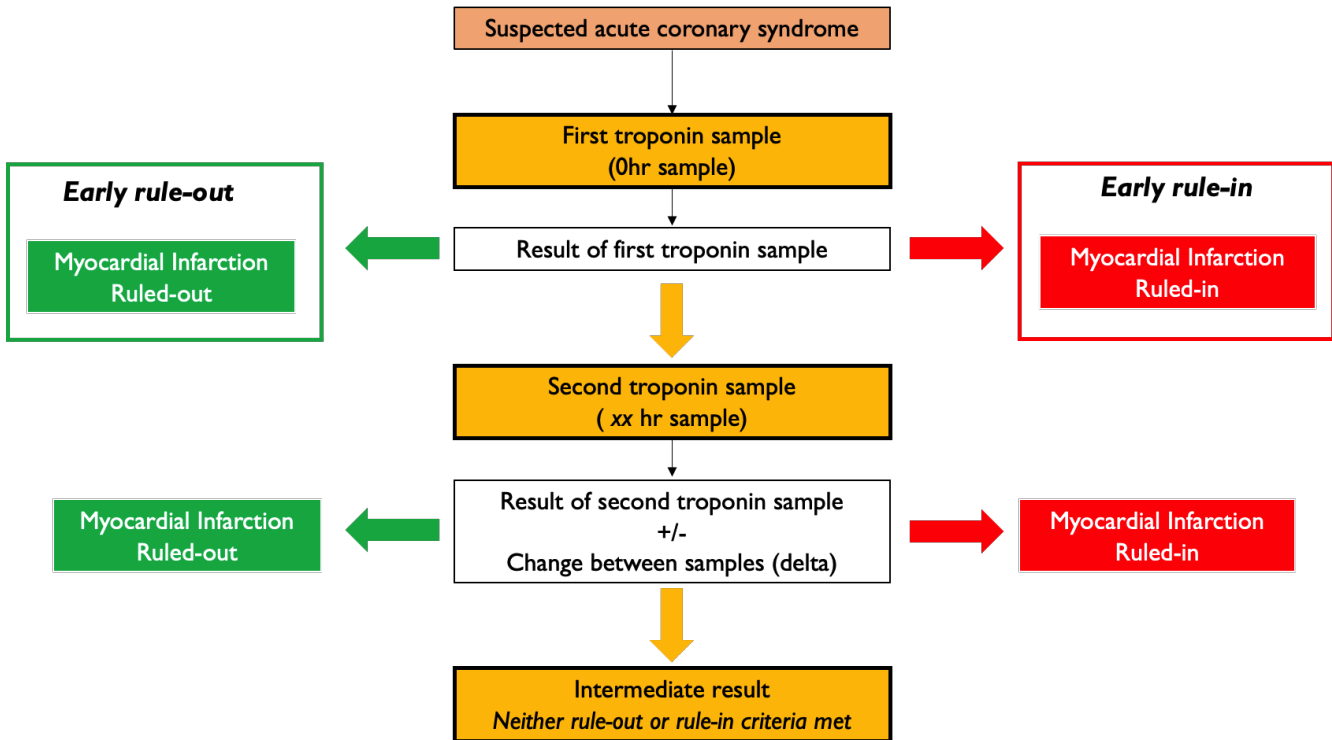
Which biomarker is used in your institutions structured diagnostic pathway?

- Contemporary troponin
- High sensitivity troponin
- Point of care troponin
- Copeptin
- Creatine-kinase MB
- Myoglobin
- No biomarker used
- Don't know
- Other

If you selected Other, please specify:

Early diagnostic pathways for myocardial infarction which use cardiac troponin

Below is a mock early diagnostic chest pain pathway. This diagram demonstrates common pathway design features and terminology and can be used as a guide for the following questions.



The following questions are on the **EARLY RULE-OUT** of myocardial infarction. **EARLY RULE-OUT** refers to the rule-out of myocardial infarction on the basis of a single presentation troponin measurement.

Does the pathway in use at your institution have an **early rule-out** phase ?

- Yes
- No
- Don't know

Do you know the concentration of cardiac troponin used as the cut-off for **early rule-out**?

- Yes
- No

Is this cut-off the same for males and females?

- Yes
- No

What is the cut-off for MALES?

What is the cut-off for FEMALES?

What cut-off is used?

Please specify units.

- ng/L
- µg/L

Is the **early rule-out** of myocardial infarction dependant on the time between symptom onset and troponin testing? If, yes please select the minimum time in hours from symptom onset to troponin testing.

If you selected Other, please specify:

The following questions are on the **EARLY RULE-IN** of myocardial infarction. **EARLY RULE-IN** refers to the rule-in of myocardial infarction on the basis of a single presentation troponin measurement.

Does the pathway in use at your institution have an **early rule-in** phase ?

- Yes
- No
- Don't know

Do you know the concentration of troponin used as the cut-off for **early rule-in**?

- Yes
- No

Is this cut-off the same for males and females?

- Yes
- No

What is the cut-off for MALES?

What is the cut-off for FEMALES?

What cut-off is used?

Please specify units.

- ng/L
- µg/L

This question is on **REPEAT TROPONIN** sampling.

In patients who do **NOT** meet early rule-out or rule-in criteria on admission testing at what time interval from the first sample do you repeat troponin sampling i.e. take a second troponin measurement?

If you selected Other, please specify:

The following questions are on **DELTA** criteria.

Does your pathway use a delta value (the difference in value between serial samples) to aid the **rule-out** of myocardial infarction?

- Yes
- No
- Don't know

What value is used for **rule-out**?

Please enter a whole number (integer).

Please specify units.

- ng/L
- µg/L

Does your pathway use a delta value (the difference in value between serial samples) to aid the **rule-in** of myocardial infarction?

- Yes
- No
- Don't know

Is this value based on a relative or absolute difference between troponin samples? A *relative value* is a percentage difference between serial samples. An *absolute value* is an integer difference between serial samples.

- Absolute
- Relative

What value is used?

Please specify units.

- ng/L
- µg/L

What value is used?

If you selected Other, please specify:

This question refers to patients who have **INTERMEDIATE TROPONIN RESULTS** after two troponin samples.

Does your chest pain pathway have a documented next stage for the management of patients with intermediate troponin results?

- Yes
- No
- Don't know

What are the recommendations? (select all that apply)

- Repeat troponin sampling i.e. take a third troponin sample
- Admission to ambulatory care
- Admission to acute medicine ward
- Admission to cardiology ward
- Admission to coronary care unit
- Echocardiography
- Computer tomography coronary angiography (CTCA)
- Coronary angiogram
- Other

If you selected Other, please specify:

What time is the third troponin sample taken? Please specify the interval between the second and third sample in whole hours.

- 1 hour
- 2 hours
- 3 hours
- 6 hours
- 12 hours
- Other

If you selected Other, please specify:

The following question is on patient follow-up.

Does your institution have a formal policy for the out-patient follow-up or further investigation of patients who have troponin measurements between the rule-out threshold and the 99th centile who do not require hospital admission?

- Yes
- No
- Don't know

What follow-up is recommended?

- Please select at least 1 answer(s).
- Rapid access chest pain clinic
 - Cardiology outpatient clinic
 - General medicine outpatient clinic
 - Primary care follow-up
 - No follow-up

Other

If you selected Other, please specify:

What investigations are recommended? (select all that apply)

Please select at least 1 answer(s).

- Exercise tolerance test
- Stress echocardiography
- Myocardial perfusion scan
- Computer tomography coronary angiography
- Coronary angiogram
- No investigations
- Other

If you selected Other, please specify:

Does your institution have a formal policy for the out-patient follow-up or further investigation of patients who have troponin measurements below the rule-out threshold and who do not require hospital admission?

- Yes
- No
- Don't know

What follow-up is recommended?

Please select at least 1 answer(s).

- Rapid access chest pain clinic
- Cardiology outpatient clinic
- General medicine outpatient clinic
- Primary care follow-up
- No follow-up
- Other

If you selected Other, please specify:

What investigations are recommended? (select all that apply)

Please select at least 1 answer(s).

- Exercise tolerance test
- Stress echocardiography
- Myocardial perfusion scan
- Computer tomography coronary angiography
- Coronary angiogram
- No investigations
- Other

If you selected Other, please specify:

Early diagnostic pathways for myocardial infarction which use a biomarker other than cardiac troponin

The following question is on the **EARLY RULE-OUT** of myocardial infarction using a single presentation biomarker measurement.

Does the pathway in use at your institution have an **early rule-out** phase? An early rule-out phase is one which allows the rule-out of myocardial infarction on the basis of a single presentation biomarker measurement.

- Yes
- No
- Don't know

Is the **early rule-out** of myocardial infarction dependant on the time between symptom onset and biomarker sampling? If, yes please select the minimum time in hours from symptom onset to testing.

If you selected Other, please specify:

The following questions are on the **EARLY RULE-IN** of myocardial infarction on the basis of a single presentation biomarker measurement.

Does the pathway in use at your institution have an **early rule-in** phase ? An early rule-in phase is one which allows the rule-out of myocardial infarction on the basis of a single presentation biomarker measurement.

- Yes
- No
- Don't know

This question is on **REPEAT BIOMARKER** sampling.

In patients who do NOT meet early rule-out or early rule-in criteria on admission testing at what time interval from the first sample do you repeat biomarker sampling i.e. take a second biomarker measurement?

If you selected Other, please specify:

This question is on **DELTA** criteria.

Does your pathway use a delta value (the difference in value between serial samples) to aid the **rule-out** of myocardial infarction?

- Yes
- No

What value is used for **rule-out**?

Does your pathway use a delta value (the difference in value between serial samples) to aid the **rule-in** of myocardial infarction?

- Yes
- No

Is this value based on a relative or absolute difference in between biomarker samples? A *relative value* is a percentage difference between serial samples. An *absolute value* is an integer difference between serial samples.

- Absolute
- Relative

What value is used?

What value is used?

If you selected Other, please specify:

This question refers to patients who have **INTERMEDIATE RESULTS** after two biomarker samples. These patients have neither had myocardial infarction ruled-out or ruled-in after two samples.

Does your chest pain pathway have a documented next stage for the management of patients with intermediate biomarker results?

- Yes
- No
- Don't know

What are the recommendations? (select all that apply)

Please select at least 1 answer(s).

- Repeat troponin sampling i.e. take a third biomarker sample
- Admission to ambulatory care
- Admission to acute medicine ward
- Admission to cardiology ward
- Admission to coronary care unit
- Echocardiography
- Computer tomography coronary angiography (CTCA)
- Coronary angiogram
- Other

If you selected Other, please specify:

What time is the third sample taken? Please specify the interval between the second and third sample in whole hours.

- 1 hour
- 2 hours
- 3 hours
- 6 hours
- 12 hours
- Other

If you selected Other, please specify:

Clinical decision support tools

Does the diagnostic pathway in use at your institution incorporate any of the following? (select all that apply)

- Cardiac risk score e.g. GRACE, HEART, T-MACS etc
- Shared decision making tool
- Artificial intelligence

Which risk score is used?

If you selected Other, please specify:

Defining myocardial infarction

In your practice, do you classify patients according to the Fourth Universal Definition of Myocardial Infarction?

- Yes
- No

In your correspondence with other health care professionals do you use the terms: type 1 myocardial infarction, type 2 myocardial infarction, acute myocardial injury, chronic myocardial injury, no myocardial injury.

- Yes
- No

In your communication with patients do you use the terms: type 1 myocardial infarction, type 2 myocardial infarction, acute myocardial injury, chronic myocardial injury, no myocardial injury.

- Yes
- No

Diagnostic performance

In patients who meet rule-out criteria for myocardial infarction in the Emergency Department, what would you consider an acceptable risk of missing an index myocardial infarction?

- 1 in 10 (10%)
- 1 in 50 (2.5%)
- 1 in 100 (1%)
- 1 in 200 (0.5%)
- 1 in 400 (0.25%)
- 1 in 1000 (0.1%)
- No risk acceptable

On a scale of 1 to 10, where 10 represents most certain and 1 least certain, how certain of the diagnosis of myocardial infarction would you want to be before starting dual antiplatelet therapy and anticoagulation? Consider the patient to be of middle age, with no significant comorbidities.

	1	2	3	4	5	6	7	8	9	10	Dont know
Probability of myocardial infarction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thank-you

Thank-you for taking the time to complete this survey. Please share this survey with your colleagues using the URL xxxxxx

If you are willing to send a copy of the diagnostic pathway in use at your institution to the survey authours then please contact xxxxx

Key for selection options

1 - What country are you based in?

Afghanistan
Albania
Algeria
Andorra
Angola
Antigua and Barbuda
Argentina
Armenia
Australia
Austria
Azerbaijan
The Bahamas
Bahrain
Bangladesh
Barbados
Belarus
Belgium
Belize
Benin
Bhutan
Bolivia
Bosnia and Herzegovina
Botswana
Brazil
Brunei
Bulgaria
Burkina Faso
Burundi
Cambodia
Cameroon
Canada
Cape Verde
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo, Republic of the
Congo, Democratic Republic of the
Costa Rica
Cote d'Ivoire
Croatia
Cuba
Cyprus
Czech Republic
Denmark

Djibouti
Dominica
Dominican Republic
East Timor (Timor-Leste)
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Estonia
Ethiopia
Fiji
Finland
France
Gabon
The Gambia
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
Hungary
Iceland
India
Indonesia
Iran
Iraq
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kazakhstan
Kenya
Kiribati
Korea, North
Korea, South
Kosovo
Kuwait
Kyrgyzstan
Laos
Latvia
Lebanon
Lesotho
Liberia
Libya
Liechtenstein
Lithuania
Luxembourg
Macedonia
Madagascar

Malawi
Malaysia
Maldives
Mali
Malta
Marshall Islands
Mauritania
Mauritius
Mexico
Micronesia, Federated States of
Moldova
Monaco
Mongolia
Montenegro
Morocco
Mozambique
Myanmar (Burma)
Namibia
Nauru
Nepal
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
Norway
Oman
Pakistan
Palau
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russia
Rwanda
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Samoa
San Marino
Sao Tome and Principe
Saudi Arabia
Senegal
Serbia
Seychelles
Sierra Leone
Singapore
Slovakia
Slovenia
Solomon Islands
Somalia
South Africa
South Sudan

Spain
Sri Lanka
Sudan
Suriname
Swaziland
Sweden
Switzerland
Syria
Taiwan
Tajikistan
Tanzania
Thailand
Togo
Tonga
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
Tuvalu
Uganda
Ukraine
United Arab Emirates
United Kingdom
United States of America
Uruguay
Uzbekistan
Vanuatu
Vatican City (Holy See)
Venezuela
Vietnam
Yemen
Zambia
Zimbabwe

5 - What is your speciality?

Emergency medicine
Acute medicine
Cardiology
Laboratory (clinical)
Laboratory (science)
Other

13 - Which contemporary troponin assay is in use at your institution?

Troponin I
Troponin T
Don't know

15 - Which analysis platform is used?

Abbott ARCHITECT
Beckman Accu Access 2
Beckman Dxl Accu
Ortho VITROS Immunodiagnostic
Radiometer AQT90 FLEX
Roche cobas
Roche cobas STAT
Siemens ADVIA Centaur Systems
Siemens Atellica

Siemens Dimension Vista Systems
Siemens Dimension EXL Systems
Tosoh AIA
Don't know
Other

16 - Which high-sensitivity troponin assay is in use at your institution?

Troponin I
Troponin T
Don't know

17 - Who is the assay manufacturer?

Abbott
Beckman
bioMérieux
ET Healthcare
Fujirebio
LSI Medience (formerly Mitsubishi)
Ortho
Quidel
Roche
Siemens
Tosoh
Don't Know
Other

18 - Which analysis platform is used?

Abbott Alinity
Abbott ARCHITECT
Beckman Coulter Access 2
bioMérieux VIDAS
ET Healthcare Pylon
Fujirebio Lumipulse G
LSI Medience PATHFAST
Ortho VITROS
Quidel Alere TriageTrue
Roche cobas
Siemens ADVIA Centaur
Siemens ATELLICA
Siemens Dimension ExL
Siemens Dimension VISTA
Tosoh CL AIAPACK
Don't Know
Other

19 - Which point of care troponin assay do you use?

Contemporary Troponin I (POC)
Contemporary Troponin T (POC)
High sensitivity Troponin I (POC)
High sensitivity Troponin T (POC)

20 - Who is the assay manufacturer?

Abbott
LSI Medience (formerly Mitsubishi)
Quidel
Radiometer

Response Biomedical
Roche
Siemens
Don't know
Other

21 - Which analysis platform is used?

Abbott i-STAT
LSI Medience PATHFAST
Quidel Alere Triage Cardiac Panel
Quidel Alere Triage Cardio
Quidel Alere Triage SOB
Quidel Alere TriageTrue
Radiometer AQT90 FLEX
Response Biomedical RAMP
Roche CARDIAC POC
Siemens ATELLICA VTLi
Siemens Stratus CS Acute Care test pack
Don't know
Other

25.b - Is the early rule-out of myocardial infarction dependant on the time between symptom onset and troponin testing? If, yes please select the minimum time in hours from symptom onset to troponin testing.

No
1 hour
2 hours
3 hours
6 hours
Other

27 - In patients who do NOT meet early rule-out or rule-in criteria on admission testing at what time interval from the first sample do you repeat troponin sampling i.e. take a second troponin measurement?

1 hour
2 hours
3 hours
6 hours
12 hours
Other
Don't know

29.a.ii - What value is used?

10%
20%
50%
Other

33.a - Is the early rule-out of myocardial infarction dependant on the time between symptom onset and biomarker sampling? If, yes please select the minimum time in hours from symptom onset to testing.

No
1 hour
2 hours
3 hours
6 hours
Other

35 - In patients who do NOT meet early rule-out or early rule-in criteria on admission testing at what time interval from the first sample do you repeat biomarker sampling i.e. take a second biomarker measurement?

- 1 hour
- 2 hours
- 3 hours
- 6 hours
- 12 hours
- Other
- No repeat measurement

37.a.ii - What value is used?

- 10%
- 20%
- 50%
- Other

39.a - Which risk score is used?

- EDACS
 - GRACE
 - HEART
 - PURSUIT
 - T-MACS
 - TIMI
 - Other
-