Investigations

Perform a resting 12-lead ECG

ECG suggestive of STEMI

ECG suggestive of NSTE-ACS

Go to ACS - management
1 Background information

Quick info:

Objective and purpose of the care map
The purpose of this care map is to define the appropriate diagnosis and management of acute coronary syndrome in adults. The objective is to reduce inappropriate investigation, prescribing, and referral of patients presenting to provider organisations in Qatar.

Scope
Aspects of care covered within this care map include:
- Assessment and stratification of acute chest pain.
- Initial assessment and management of ACS.
- Ongoing management of ACS.

Aspects of care not covered within this care map, include:
- Management of stable angina.
- Non-cardiac causes of chest pain.
- Detailed information on cardiac rehabilitation.

Definitions
ACS:
- Is defined as a condition in which there is a coronary artery event with plaque rupture, erosion, or coronary dissection, resulting in the formation of intra-coronary thrombus [1].
- Includes the following [1,2]:
  - STEMI.
  - NSTEMIACS, which is comprised of:
    - Unstable angina.
    - NSTEMI.

MI:
- Sudden insufficiency of the blood supply to the myocardium resulting in myocardial necrosis [3].
- Usually occurs as a result of thrombotic occlusion of a coronary artery and typically results in [1,4]:
  - Cardiac chest pain.
  - Raised biomarkers of myocardial damage.
  - Characteristic ECG changes.

STEMI:
- Myocardial infarction with either ST-segment elevation or new onset left bundle branch block [1,4].

NSTEMI:
- Myocardial infarction with either ST-segment depression or T-wave inversion [1,4].

Unstable angina is defined as [1]:
- A new onset of chest pain or discomfort, or
- Abrupt deterioration in previously stable angina.
- With frequent occurrences of chest pain or discomfort; and
- With little or no exertion.
- Episodes are often prolonged.

Epidemiology
In 2013, 12.9% of registered deaths in Qatar were related to ASCVD [5]:
- In the Qatari population, 12.2% of deaths were related to ASCVD.
- In the non-Qatari population, 13.2% of deaths were related to ASCVD.
ASCVD patients in the Gulf region have been shown to develop the condition approximately a decade earlier than in western countries [6]. The relatively young age of ACS presentation may contribute to the higher prevalence of STEMI in the region (45.6%) compared to populations worldwide [7].
The prevalence of risk factors for ASCVD in the 2012 Qatar Stepwise Survey of respondents was as follows [8]:

• Raised blood pressure in 32.9%:
  • Females – 37.7%.
  • Males – 28%.
• Raised total cholesterol in 21.9%:
  • Females – 24.6%.
  • Males – 19.1%.
• Raised blood glucose (blood glucose ≥110 mg/dL) as well as those with history of receiving medication for diabetes mellitus was 16.7%:
  • Males – 17.6%.
  • Females – 15.9%.
• Smoking was 16.4%.
  • Males – 31.9%.
  • Females – 1.2%.
• Low level of physical activity was 45.9%:
  • Females – 54.2%.
  • Males – 37.4%.
• Obesity (BMI ≥30 kg/m²) was 41.4%:
  • Females – 43.2%.
  • Males – 39.5%.

Risk factors for ACS include [2,9-10]:
• Older age.
• Smoking.
• Hypertension.
• Diabetes mellitus.
• Raised cholesterol.
• Impaired renal function.
• Obesity.
• Inactivity.
• Family history of ASCVD.

References:
Please see the care map’s Provenance.

2 Updates to this care map

Quick info:
Date of publication: 19-Mar-2017
Please see the care map’s Provenance for additional information on references, contributors, and the editorial process.

3 Key recommendations of the care map

Quick info:
The key recommendations of this care map are:

Emergency and urgent referral:
• Referral to the Emergency Department is indicated if any two of the following are present [R-GDG]:
  • The patient reports active cardiac chest pain.
  • The patient has risk factors for ASCVD.
  • The patient has abnormal findings on a resting 12-lead ECG (or a 12-lead ECG is unavailable).
  • The patient has an elevated troponin level.
Urgent referral to an outpatient cardiology clinic is indicated if [R-GDG]:
- The patient is pain free but has had an episode of cardiac chest pain in the last 72 hours; and
- No ECG changes or positive troponin levels are present.

**ECG assessment:**
- A 12-lead ECG should be recorded within 10 minutes of first presentation and interpreted immediately by an experienced physician [11,12][L1, RGA1].

**Troponin levels:**
- Test for myocardial damage using troponin I or troponin T at initial assessment and a second sample 3-6 hours later (depending on the assay used) [14][L2, RGA1].
- Do not delay the initiation of reperfusion treatment while awaiting results [11].

**Primary PCI versus fibrinolysis in STEMI:**
- Immediately assess eligibility for primary PCI [2,11][L3, RGA2]:
  - Coronary angiography with follow-on PCI, if indicated, is the preferred coronary reperfusion strategy in STEMI.
  - Primary PCI should be delivered within 120 minutes of first medical contact if seen at a non-primary PCI centre; or
  - Within 90 minutes if seen at a primary PCI centre.
- Fibrinolysis should be considered if [12]:
  - Primary PCI cannot be delivered within the above timeframes; or
  - Primary PCI is contraindicated (e.g. if known contrast allergy); or
  - Primary PCI is declined.
- For fibrinolysis, the following recommendations are made [12]:
  - Where fibrinolysis is planned, it should be administered within 30 minutes of arrival at the Emergency Department.
  - If PCI cannot be delivered within optimal timeframes and fibrinolysis is contraindicated (see below), transfer the patient to an angiography/PCI centre for assessment.

**NSTE-ACS:**
- Use TIMI and/or GRACE scores to assess risk in patients with NSTE-ACS [18,19].
- For intermediate and high-risk patients, offer [2,12]:
  - Coronary angiography with follow on PCI.
  - CABG.
- For low-risk patients, offer:
  - Conservative management with dual antiplatelet therapy without early coronary angiography [2,12][L1, RGA1]:
  - Consider non-invasive imaging in patients who have been conservatively managed and who have not had coronary angiography [2,12][L2] with:

**Additional pharmacotherapy:**
- All patients with ACS should be offered treatment with the following medications following initial stabilisation [12,17][L1]:
  - Dual antiplatelet therapy.
  - ACE inhibitor.
  - Beta-blocker.
  - Statin.
  - Anticoagulation may also be appropriate.

**Cardiac rehabilitation:**
- Patients who have had a MI should be enrolled in a system of well-structured cardiac rehabilitation or secondary prevention programme [11][L1].
- Cardiac rehabilitation should begin as soon as possible after admission and before discharge from hospital [17][L1]:
  - Continues with structured programmes in the community for approximately 12 weeks [24].

References:
Please see the care map's Provenance.
Quick info:
The abbreviations used in this care map are as follows:

ACE
Angiotensin converting enzyme
ACS
Acute coronary syndrome
ARB
Angiotensin-receptor blocker
ASCVD
Atherosclerotic cardiovascular disease
BP
Blood pressure
CABG
Coronary artery bypass graft
CAD
Coronary artery disease
CBC
Complete blood count
COPD
Chronic obstructive pulmonary disease
CT
Computed tomography
ECG
Electrocardiogram
GI
Gastrointestinal
GP IIb/IIIa
Glycoprotein IIb/IIIa
GRACE
Global Registry of Acute Coronary Events
GTN
Glyceryl trinitrate
IM
Intramuscular
INR
International normalised ratio
IV
Intravenous
JVP
Jugular venous pressure
LBBB
Left bundle branch block
LVEF
Left ventricular ejection fraction
MI
Myocardial infarction
MRI
Magnetic resonance imaging
NSTE-ACS
Non-ST-elevation acute coronary syndrome
NSTEMI
Non-ST-segment elevation myocardial infarction
PCI
5 Presentation

Quick info:
Clinical presentation of ACS:
• Typically present with central or band-like chest pain, or discomfort, which radiates to the jaw, arms, or neck; however, not all patients present with typical pain [1].
• Pain may be described as discomfort, abdominal sensations (e.g. gas, indigestion, fullness), pressure, tightness, or heaviness [1].
• Associated symptoms include [1,11]:
  • Nausea and vomiting.
  • Marked sweating.
  • Breathlessness.
  • Abdominal pain.
  • Syncope.
NB: Symptoms may be atypical in the elderly and patients with diabetes mellitus, chronic renal disease, or dementia [10,11]. Suspect ACS if [1]:
• Pain is experienced to last longer than 15 minutes in the chest and/or other areas, e.g. arms, back, or jaw.
• Chest pain is precipitated by exertion or emotional stress or is associated with:
  • Nausea and vomiting.
  • Marked sweating.
  • Breathlessness.
  • Haemodynamic instability.
NB: Do not use the patient’s response to GTN to make the diagnosis [1][L2, RGA1].
References:
Please see the care map's Provenance.

6 Urgent referral considerations

Quick info:
Referral to the Emergency Department is indicated if any two of the following are present [R-GDG]:
• The patient reports active cardiac chest pain.
• The patient has risk factors for ASCVD.
• The patient has abnormal findings on a resting 12-lead ECG (or a 12-lead ECG is unavailable).
• The patient has an elevated troponin level.
Urgent referral to an outpatient cardiology clinic is indicated if [R-GDG]:
• The patient is pain free but has had an episode of cardiac chest pain in the last 72 hours; and
• No ECG changes or positive troponin levels are present.

References:
Please see the care map's Provenance.

8 Differential diagnosis

Quick info:
The differential diagnosis of ACS includes:

• Cardiac causes [1,12]:
  • Stable angina.
  • Aortic dissection.
  • Pericarditis.
  • Acute congestive cardiac failure.
  • Acute arrhythmias.
• Respiratory causes [1,4,11,12]:
  • Pulmonary embolism.
  • Pneumothorax.
  • Pneumonia and/or pleuritis.
• Gastrointestinal causes [1,12,13]:
  • Acute pancreatitis.
  • Peptic ulcer disease.
  • Gastro-oesophageal reflux.
  • Acute cholecystitis.
  • Oesophageal spasm.
  • Oesophageal rupture.
  • Reflux oesophagitis.
• Musculoskeletal causes [1,12]:
  • Rib fracture.
  • Costochondritis.
• Other causes [1,11-13]:
  • Psychogenic chest pain.
  • Herpes zoster.
  • Bornholm's disorder (Coxsackie B viral infection).

References:
Please see the care map's Provenance.

9 Investigations

Quick info:
Perform a resting 12-lead ECG in all patients presenting with suspected ACS:
• The ECG should be recorded within 10 minutes of first presentation and interpreted immediately by an experienced physician [1,11,12][L1, RGA1].
• Serial ECGs should be performed every 15-30 minutes within the first hour of presentation [13].
• Do not delay referral to the Emergency Department if ACS is suspected [1][L3, RGA2]:
  • Send the results to the hospital before the patient arrives [1][L1, RGA1].
Acute coronary syndrome - investigation

Medicine > Cardiology > Acute coronary syndrome

- NB: Ambulances in Qatar are able to transmit ECG traces to the Heart Hospital for decision on treatment with primary PCI (trans-satellite ECG system).

Test for elevated troponin levels:
- Troponin I or T [1,11][L1, RGA1]:
  - Test at initial assessment and a second sample 3-6 hours later (depending on the assay used) [14][L2, RGA1].
  - Do not delay the initiation of reperfusion treatment while awaiting results.
  - If ACS is still suspected, a repeat troponin level should be obtained 6 hours after initial onset of symptoms.
  - Consider other causes of a raised troponin level, e.g. myocarditis, aortic dissection, pulmonary embolism.

Other blood tests [11][L2, RGA2]:
- CBC.
- Creatinine.
- Blood glucose.
- INR in patients on vitamin K antagonists.

References:
Please see the care map's Provenance.

10 Perform a resting 12-lead ECG

Quick info:
- NB: Do not exclude ACS if the ECG is normal [1][L2].
- A ventricular-paced rhythm may prevent interpretation of ST-segment changes [9].

References:
Please see the care map's Provenance.

11 ECG suggestive of STEMI

Quick info:
ECG changes consistent with STEMI [1][L1, RGA1]:
- Regional ST-segment elevation; or
- New or presumed-new LBBB.

ST-segment elevation [9][L2, RGA1]:
- Should be measured at the J point in two contiguous leads with the following cut-off points:
  - 0.1 mV or more in all leads other than V2-V3.
  - In leads V2-V3 the following cut-off points apply:
    - 0.25 mV or more in men under age 40 years.
    - 0.2 mV or more in men age 40 years and older.
    - 0.15 mV or more in women.

Consider performing an atypical ECG if a MI is suspected [9][L2]:
- Suggested by isolated ST-segment depression of 0.05 mV or more in leads V1-V3.
- ST-segment elevation diagnostic of a posterior MI [9][L2, RGA1]:
  - ST-segment elevation in V5-V9 of:
    - 0.05 mV or more.
    - 0.1 mV or more in men under age 40 years.
- Additional right-sided chest leads (V3R-V6R) are recommended to detect ST-segment elevation in all cases of inferior wall MI, to exclude an associated right ventricular MI [9][L2, RGA2].

References:
Please see the care map's Provenance.
12 ECG suggestive of NSTE-ACS

Quick info:
ECG changes consistent with NSTE-ACS (i.e. NSTEMI or unstable angina) [1][L2]:
- ST-segment depression.
- Deep T-wave inversion.
Consider managing patients for NSTEMI or unstable angina if [1][L2]:
- ST-segment changes are absent but there are other Q and T wave changes.
- The diagnoses are highly likely on the basis of clinical assessment.

References:
Please see the care map's Provenance.
Acute coronary syndrome

Provenance Certificate

Overview

This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

Whilst the MOPH has sponsored the development of the care map, the MOPH has not influenced the specific recommendations made within it.

This care map was approved on 19 Mar 2017.

For information on changes in the last update, see the information point entitled 'Updates to this care map' on each page of the care map.

Editorial approach

This care map has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The care map will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology, used to develop this care map, has involved the following critical steps:

- Extensive literature search for well reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group, comprised of practising physicians and subject matter experts from across provider organisations in Qatar.
- Independent review of the guideline by the Clinical Governance body appointed by the MOPH, from amongst stakeholder organisations across Qatar.

Explicit review of the care map by patient groups was not undertaken.

Whilst the MOPH has sponsored the development of the care map, the MOPH has not influenced the specific recommendations made within it.

Sources of evidence

The professional literature published in the English language has been systematically queried using specially developed, customised, and tested search strings. Search strategies are developed to allow efficient yet comprehensive analysis of relevant publications for a given topic and to maximise retrieval of articles with certain desired characteristics pertinent to a guideline.

For each guideline, all retrieved publications have been individually reviewed by a clinical editor and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals (i.e. journals that are read and cited most often within their field).
3. Address an aspect of specific importance to the guideline in question.

Where included, the ‘goal length of stay’ stated within this guideline is supported by and validated through utilisation analysis of various international health insurance databases. The purpose of database analysis is to confirm the reasonability and clinical appropriateness of the goal, as an achievable benchmark for optimal duration of inpatient admission.

Evidence grading and recommendations

Recommendations made within this guideline are supported by evidence from the medical literature and where possible the most authoritative sources have been used in the development of this guideline. In order to provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of authoritativeness of the evidence used, where recommendations have been made within this guideline.

Where the recommendations of international guidelines have been adopted, the evidence grading is assigned to the underlying evidence used by the international guideline. Where more than one source has been cited, the evidence grading relates to the highest level of evidence cited:

- **Level 1 (L1):**
  - Meta-analyses.
  - Randomised controlled trials with meta-analysis.
  - Randomised controlled trials.
  - Systematic reviews.

- **Level 2 (L2):**
  - Observational studies, examples include:
    - Cohort studies with statistical adjustment for potential confounders.
    - Cohort studies without adjustment.
    - Case series with historical or literature controls.
    - Uncontrolled case series.
  - Statements in published articles or textbooks.

- **Level 3 (L3):**
  - Expert opinion.
  - Unpublished data, examples include:
    - Large database analyses.
    - Written protocols or outcomes reports from large practices.

In order to give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used, where recommendations are made:

- **Recommendation Grade A1 (RGA1):** Evidence demonstrates at least moderate certainty of at least moderate net benefit.
- **Recommendation Grade A2 (RGA2):** Evidence demonstrates a net benefit, but of less than moderate certainty, and may consist of a consensus opinion of experts, case studies, and common standard care.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C1 (RGC1):** Evidence demonstrates a lack of net benefit; additional research is recommended.
- **Recommendation Grade C2 (RGC2):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended best practice on the basis of the clinical experience of the Guideline Development Group members.
Acute coronary syndrome

References


Acute coronary syndrome


Guideline Development Group members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the Clinical Governance Group. The GDG members have reviewed and provided feedback on the draft guideline relating to the topic. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

<table>
<thead>
<tr>
<th>Guideline Development Group members</th>
<th>Name</th>
<th>Title</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Ahmad Mostafah Abdel Wahhab</td>
<td>Senior Specialist, Family Medicine</td>
<td>Primary Health Care Corp</td>
<td></td>
</tr>
<tr>
<td>Dr Salah Elbadri</td>
<td>Consultant Cardiologist</td>
<td>Hamad Medical Corp</td>
<td></td>
</tr>
<tr>
<td>Dr Abdurazzak Gehani</td>
<td>Consultant Cardiologist</td>
<td>Al Ahli Hospital</td>
<td></td>
</tr>
<tr>
<td>Dr Abdul Hakeem Hamza</td>
<td>Consultant Family Medicine</td>
<td>Primary Health Care Corp</td>
<td></td>
</tr>
<tr>
<td>Dr Raveendran Pachakkootathil</td>
<td>Specialist, Cardiology</td>
<td>Aster Medical Center</td>
<td></td>
</tr>
<tr>
<td>Dr Nermin Abdel-Rahman Shalaan</td>
<td>Specialist, Cardiology</td>
<td>Al Emadi Hospital</td>
<td></td>
</tr>
</tbody>
</table>

Responsibilities of healthcare professionals

This care map has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising their clinical judgement in the care of patients presenting to them.

The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or carers and should consider the individual risks and benefits of any intervention that is contemplated in the patient’s care.
Acknowledgements

The following individuals are recognised for their contribution to the successful implementation of the National Guidelines project.

Healthcare Quality Management and Patient Safety Department of the MOPH:

- Ms Huda Amer Al-Katheeri, Acting Director & Project Executive.
- Dr Alanoud Saleh Alfehaidi, Guideline & Standardisation Specialist.
- Dr Ilham Omer Siddig, Guideline & Standardisation Specialist.
- Ms Maricel Balagtas Garcia, Guideline Standardisation Coordinator.
- Dr Rasmeh Ali Salameh Al Huneiti, Research Training & Education Specialist.
- Mr Mohammad Jaran, Risk Management Coordinator.

Hearst Health International:

- Dr Mehmoood Syed, Middle East Clinical Director & Project Clinical Lead.
- Mr Michael Redmond, Clinical Programmes Manager.
- Ms Deepti Mehta, Editorial and Research Manager.
- Ms Rebecca Cox, Editorial and Research Team Leader.
- Ms Shuchita Deo, Lead Editorial Assistant.
- Ms Siobhan Miller, Editorial Assistant.
- Ms Fatima Rahman, Editorial Assistant.
- Ms Tahmida Zaman, Editorial Assistant.
- Ms Emma Ramstead, Information Specialist.
- Dr Amy Glossop, Clinical Editor.
- Dr Zara Quail, Clinical Editor.
- Dr Sabine Fonderson, Clinical Editor.