NATIONAL CLINICAL GUIDELINES

THE ASSESSMENT & MANAGEMENT OF ACUTE CORONARY SYNDROME IN ADULTS

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المبادئ الإرشادية السريرية لدولة قطر
NATIONAL CLINICAL GUIDELINES FOR QATAR

State of Qatar
MINISTRY OF PUBLIC HEALTH

Version History

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1.0	Final	19th March 2017	Guidelines Team	Final version for publication.
2.0	Final	20th August 2020	Guidelines Team	Updates to Sections 8, 9, 10, 13 & 14.

Citation

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Abbreviations

The abbreviations used in this guideline 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
ETT	Exercise tolerance test
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
METS	Estimated metabolic equivalents of task
MI	Myocardial infarction
MRI	Magnetic resonance imaging
NSTE-ACS	Non-ST-elevation acute coronary syndrome
NSTEMI	Non-ST-segment elevation myocardial infarction
PCI	Percutaneous coronary intervention
PDE5	Phosphodiesterase type 5
RV	Right ventricle
SpO_2	Oxygen saturation
STEMI	ST-segment elevation myocardial infarction
TIA	Transient ischaemic attack
TIMI	Thrombolysis In Myocardial Infarction
UFH	Unfractionated heparin

View Pathway

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1 Information about this Guideline

1.1 Objective and Purpose of the Guideline

The purpose of this guideline is to define the appropriate diagnosis and management of acute coronary syndrome in adults. The objective is to improve appropriate investigation, prescribing and referral of patients presenting to provider organisations in Qatar. It is intended that the guideline will be used primarily by physicians, nurses, and health educators in primary care and specialist settings.

1.2 Scope of the Guideline

Aspects of care covered within this guideline include:

- Assessment and stratification of acute chest pain.
- Initial assessment and management of acute coronary syndrome (ACS).
- Ongoing management of ACS.

Aspects of care not covered within this guideline, include:

- Management of stable angina.
- Non-cardiac causes of chest pain.
- Atherosclerotic cardiovascular disease risk assessment and prevention.
- Detailed information on cardiac rehabilitation.

1.3 Editorial Approach

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.

The editorial methodology, used to develop this guideline, 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 healthcare professionals, subject matter experts and patient representatives, from across Qatar.
- Independent review of the guideline by the National Clinical Guidelines & Pathways Committee, appointed by the MOPH, from amongst stakeholder organisations across Qatar.

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

1.4 Sources of Evidence

The professional literature 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 member of the Editorial Team 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.
3. Address an aspect of specific importance to the guideline in question.

Further information about the literature search and appraisal process is included in the appendix.

1.5 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 A (RGA):** Evidence demonstrates at least moderate certainty of a net benefit from the recommendation.
- **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 C (RGC):** 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.

1.6 Guideline Development Group Members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the National Clinical Guidelines & Pathways Committee. The GDG members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

Guideline Development Group Members		
Name	**Title**	**Organisation**
Dr Ahmed M. Hussein Babiker	Head of Registration Section & Clinical Pharmacist	Dept of Pharmacy and Drug Control, MOPH[1]
Dr Salah Elbdri	Consultant Cardiologist	Hamad Medical Corp
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1.7 National Clinical Guidelines & Pathways Committee Members

The following table lists members of the National Clinical Guidelines & Pathways Committee (NCGPC), appointed by the MOPH. The NCGPC members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

National Clinical Guidelines & Pathways Committee (NCGPC) Members		
Name	**Title**	**Organisation**
Ms Huda Amer Al-Katheeri	Chair of the NCGPC, Director- Strategic Planning & Performance Department	Ministry of Public Health
Shk Dr Mohammed Hamad J. Al Thani	Co-Chair of NCGPC, Director of Public Health	Ministry of Public Health
Prof Anthony Akobeng	Chair Clinical Practice Guidelines Committee	Sidra Medicine
Dr Alshaymaa Mohammed A. M. Al-Motawa	Consultant Family Medicine	Qatar Petroleum
Dr Basil Bashqawi	Accreditation Coordinator, Dept of Health Professions	Ministry of Public Health

[1] Dr Ahmed Babiker attended the MOPH in his capacity as a Clinical Pharmacist and advisor on the availability of medications in Qatar.

National Clinical Guidelines & Pathways Committee (NCGPC) Members		
Name	**Title**	**Organisation**
Dr Abi Khalil Charbel	Associate Professor of Medicine Consultant Cardiology	Weill Cornell Medicine -Qatar
Dr Paul Dijkstra	Director of Medical Education	Aspetar
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Dr Ghassan Youseph Hommos	Consultant Endocrinology	Al Emadi Hospital
Dr Hani Benhassen Kilani	Senior Consultant, Executive Director for Corporate Clinical Policy and Guidelines	Hamad Medical Corporation
Dr Egon Toft	VP and Dean	College of Medicine, Qatar University

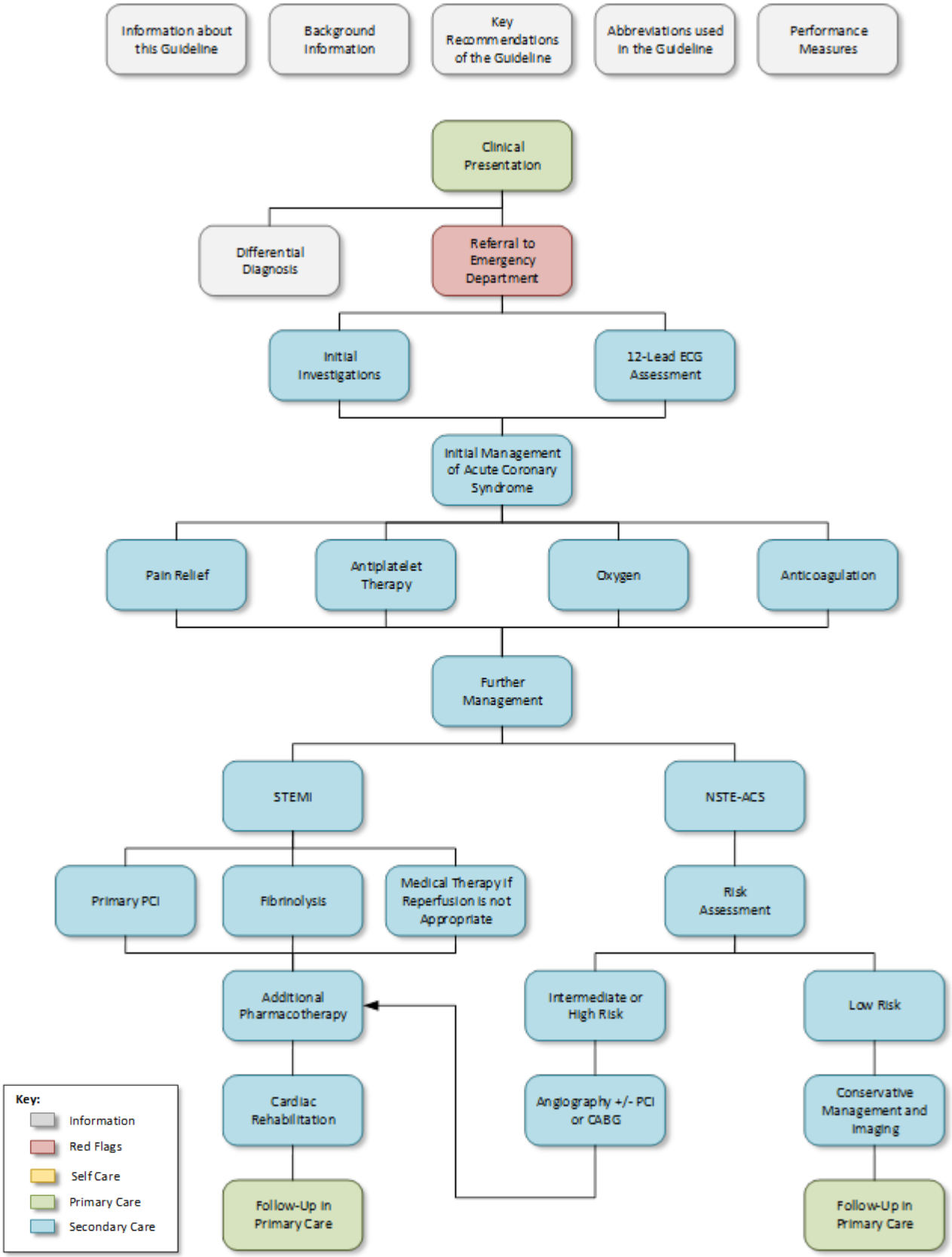
1.8 Responsibilities of Healthcare Professionals

This guideline 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 caregivers and should consider the individual risks and benefits of any intervention that is contemplated in the patient's care.

2 Acute Coronary Syndrome Pathway

Click on a box below to see the relevant page of the Pathway.



3 Key Recommendations of the Guideline

The key recommendations of this guideline are:

Emergency and Urgent Referral (*Section 7*):

- 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 (*Section 8.2*):

- A 12-lead ECG should be recorded within 10 minutes of initial presentation and interpreted immediately by an experienced physician [1–3] [**L1, RGA**].

Troponin Levels (*Section 8.1*):

- 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) [4] [**L2, RGA**].
- Do not delay the initiation of reperfusion treatment while awaiting results [1,2] .

Primary PCI versus Fibrinolysis in STEMI (*Section 10.1*):

- Immediately assess eligibility for primary PCI [2,5] **[L3, RGA]**:
  - 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 [3] :
  - 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 [3] :
  - 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.

NSTEMI-ACS (*Section 11*):

- Use TIMI and/or GRACE scores to assess risk in patients with NSTE-ACS [6,7] .
- For intermediate and high-risk patients, offer [3,5] :
  - Coronary angiography with follow on PCI
  - CABG.

- For low-risk patients, offer:
    - Conservative management with dual antiplatelet therapy without early coronary angiography [3,5] [**L1, RGA**]:
    - Consider non-invasive imaging in patients who have been conservatively managed and who have not had coronary angiography [3,5] [**L2**] with:

Additional Pharmacotherapy (*Section 12*):

- All patients with ACS should be offered treatment with the following medications following initial stabilisation [3,8] [**L1**]:
    - Dual antiplatelet therapy.
    - ACE inhibitor.
    - Beta-blocker.
    - Statin.
    - Anticoagulation may also be appropriate.

Cardiac Rehabilitation (*Section 13*):

- Patients who have had a MI should be enrolled in a system of well-structured cardiac rehabilitation or secondary prevention programme [2] [**L1**].
- Cardiac rehabilitation should begin as soon as possible after admission and before discharge from hospital [8] [**L1**]:
    - Continues with structured programmes in the community for approximately 12 weeks [9] .

4 Background Information

4.1 Definitions

Acute Coronary Syndrome (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 [1,5] :
    - ST-segment elevation myocardial infarction (STEMI).
    - Non-ST-elevation acute coronary syndrome (NSTE-ACS), which is comprised of:
        - Unstable Angina.
        - Non-ST-segment elevation myocardial infarction (NSTEMI).

Myocardial Infarction (MI):

- Sudden insufficiency of the blood supply to the myocardium resulting in myocardial necrosis [10] .
- Usually occurs as a result of thrombotic occlusion of a coronary artery and typically results in [1,11] :
    - Cardiac chest pain.
    - Raised biomarkers of myocardial damage.
    - Characteristic ECG changes.

ST-segment Elevation Myocardial Infarction (STEMI):

- Myocardial infarction with either ST-segment elevation or new onset left bundle branch block [1,11].

Non-ST-segment Elevation Myocardial Infarction (NSTEMI):

- Myocardial infarction with either ST-segment depression or T-wave inversion [1,11] .

Unstable Angina:

- 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.

4.2 Epidemiology

In 2013, 12.9% of registered deaths in Qatar were related to atherosclerotic cardiovascular disease (ASCVD)[12]:

- 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 [13] . The relatively young age of ACS presentation may contribute to the higher prevalence of STEMI in the region (45.6%) compared to populations worldwide [14] .

The prevalence of risk factors for ASCVD in the 2012 Qatar Stepwise Survey of respondents was as follows[15]:

- 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/m^2) was 41.4%:
    - Females – 43.2%.
    - Males – 39.5%.

4.3 Risk Factors

Risk factors for ACS include [5,16–18] :

- Older age.
- Smoking.
- Hypertension.
- Diabetes mellitus.
- Raised cholesterol.
- Impaired renal function.
- Obesity.
- Inactivity.
- Family history of ASCVD.

5 Presentation

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 [1,2] :
    - 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 [2,18].

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 glyceryl trinitrate (GTN) to make the diagnosis [1] [**L2, RGA**].

6 Differential Diagnosis

The differential diagnosis of ACS includes:

- Cardiac causes [1,3]:
  - Stable angina.
  - Aortic dissection.
  - Pericarditis.
  - Acute congestive cardiac failure.
  - Acute arrhythmias.
- Respiratory causes [1–3,11] :
  - Pulmonary embolism.
  - Pneumothorax.
  - Pneumonia and/or pleuritis.
- Gastrointestinal causes [1,3,19] :
  - Acute pancreatitis.
  - Peptic ulcer disease.
  - Gastro-oesophageal reflux.
  - Acute cholecystitis.
  - Oesophageal spasm.
  - Oesophageal rupture.
  - Reflux oesophagitis.
- Musculoskeletal causes [1,3] :
  - Rib fracture.
  - Costochondritis.
- Other causes [1–3,19]:
  - Psychogenic chest pain.
  - Herpes zoster.
  - Bornholm's disorder (Coxsackie B viral infection).

7 Emergency and Urgent Referral Considerations

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.

8 Initial Assessment

8.1 Initial Investigation

Perform a resting 12-lead ECG in all patients presenting with suspected ACS:

- The ECG should be recorded within 10 minutes of initial presentation and interpreted immediately by an experienced physician [1–3] [**L1, RGA**].
- Serial ECGs should be performed every 15-30 minutes within the first hour of presentation [19] .
- Do not delay referral to the Emergency Department if ACS is suspected [1] [**L3, RGA**]:
    - Send the results to the hospital before the patient arrives [1] [**L1, RGA**].
    - NB: Ambulances in Qatar are able to transmit ECG traces to the Heart Hospital for decision on treatment with primary percutaneous coronary intervention (PCI) (trans-satellite ECG system).

Test for elevated troponin levels:

- High-sensitivity troponin I or T [1,2] [**L1, RGA**]:
    - Test at initial assessment and a second sample 3-6 hours later (depending on the assay used) [4] [**L2, RGA**].
    - 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.
    - Recommended for patients with moderate or high risk of MI.
    - If the first troponin sample is negative, one high-sensitivity troponin test is recommended at presentation to rule out NSTEMI.
    - High-sensitivity troponin test is not recommended if ACS is not suspected.

Other blood tests [2] [**L2, RGA**]:

- Complete blood count (CBC).
- Creatinine.
- Blood glucose.
- International normalised ratio (INR) in patients on vitamin K antagonists.

8.2 ECG Assessment

NB: Do not exclude ACS if the ECG is normal [1] [**L2**].
A ventricular-paced rhythm may prevent interpretation of ST-segment changes [16,17] .

8.2.1 ECG Changes in STEMI

ECG changes consistent with STEMI [1] [**L1, RGA**]:

- Regional ST-segment elevation; or
- New or presumed-new left bundle branch block (LBBB).

ST-segment elevation [16,17] [**L2, RGA**]:

- 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 V_2-V_3.
    - In leads V_2-V_3 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 posterior MI is suspected [16,17] [**L2**]:

- Suggested by isolated ST-segment depression of 0.05 mV or more in leads V_1-V_3.
- ST-segment elevation diagnostic of a posterior MI [16,17] [**L2, RGA**]:
    - ST-segment elevation in V_7-V_9 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 myocardial infarction, to exclude an associated right ventricular MI [16,17] [**L2, RGA**].

8.2.2 ECG Changes in NSTE-ACS

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.

9 Initial Management of ACS

9.1 Pain Relief

Treat the pain of myocardial ischaemia as follows[1,3,16,17]:

- Sublingual or buccal GTN [1] [**L2, RGA**]:
    - Nitrates are contraindicated in right ventricular (RV) infarction and should only be administered after RV infarction has been excluded either clinically or on ECG.
- IV opioids may be used to relieve pain in ACS (IM injections should be avoided).
- Anti-emetics should be administered concurrently with opioids.

9.2 Antiplatelet Therapy

Antiplatelet therapy should be administered as follows[1,3]:

- Give dual antiplatelet therapy:
    - If primary PCI is planned, administer aspirin 300 mg with either:
        - 600 mg of clopidogrel; or
        - 180 mg of ticagrelor.
    - If fibrinolysis is planned, administer aspirin 300 mg with either:
        - 300 mg of clopidogrel, if aged ≤75 years.
        - 75 mg of clopidogrel, if aged >75 years.
- Chewable aspirin is preferred, if available.
- Offer as soon as possible unless there are clear contraindication (e.g. allergy or recent gastrointestinal (GI) bleed).
- If antiplatelets were given before arrival in hospital, send a written record with the patient.

9.3 Oxygen

Monitor oxygen saturation (SpO_2)[1]:

- Do not routinely give supplemental oxygen unless the patient has [1] [**L1, RGA**]:
    - SpO_2 of <94% and is not at risk of hypercapnic failure:
    - Aim for SpO_2 of 94-98% [1] [**L3, RGA**].
    - If the patient is at risk of hypercapnic respiratory failure (e.g. from COPD):
        - Treat to a target SpO_2 of 88-92% until a blood gas analysis is available [1] [**L2, RGA**].

9.4 Anticoagulation

Consider bleeding, thromboembolic, and cardiovascular risks when considering treatment for patients who have had a MI and have an indication for anticoagulation [8] [**L3, RGA**].

Consider anticoagulation therapy:

- For patients with STEMI who are to undergoing primary PCI [21] :
    - Unfractionated heparin (UFH) should be used; boluses can be administered as needed to maintain therapeutic levels of activated clotting time:
        - Determine whether a GP IIb/IIIa receptor antagonist has been administered.
- For patients with STEMI undergoing reperfusion with fibrinolytic therapy [21] :

    - Use anticoagulant therapy for a minimum of 48 hours and preferably for the duration of the hospitalisation (up to 8 days or until revascularisation, if performed). Options include:
        - UFH.
        - Enoxaparin.
        - Fondaparinux.
- For patients with NSTE-ACS, the following options may be used [21] :
    - Enoxaparin for the duration of the hospitalisation.
    - Fondaparinux for the duration of the hospitalisation or until PCI is performed:
        - Administer an additional anticoagulant with anti-thrombin activity if PCI is performed.
    - UFH for 48 hours or until PCI is performed.

10 Management of STEMI

10.1 Primary PCI versus Fibrinolysis

Immediately assess eligibility for primary PCI [2,5] [**L3, RGA**]:

- 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.

Note:

- The above timeframes do not apply in patients with cardiogenic shock [3] .
- Do not exclude patients who are unconscious after cardiac arrest caused by STEMI [22] [**L2**].

Fibrinolysis should be considered if [3] :

- 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.

10.1.1 Primary PCI

For primary PCI, the following recommendations are made:

- Radial access is preferred over femoral access due to fewer access site complications [5] [**L1, RGA**].
- Stenting is recommended over balloon angioplasty alone [20,23] [**L1, RGA**].
- New-generation drug-eluting stents are recommended over bare-mental stents [20,23] [**L1, RGA**].
- CABG may be indicated in some patients who are unsuitable for primary PCI [16,17] [**L2**].

10.1.2 Fibrinolysis

For fibrinolysis, the following recommendations are made [3] :

- 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.

Perform an ECG 60-90 minutes after fibrinolysis [18] [**L3, RGA**]:

- Residual ST-segment elevation suggests failed coronary reperfusion:
  - Offer immediate coronary angiography with rescue PCI if indicated [18] [**L2**].
  - Do not repeat thrombolytic therapy [18] [**L3, RGA**].
- No residual ST-segment elevation suggests successful fibrinolysis:
  - If the patient is clinically stable, consider coronary angiography during the same hospital admission, ideally within 24 hours [16–18] [**L1, RGA**].
  - If there is recurrent myocardial ischaemia following fibrinolysis [18] :
    - Seek specialist advice; and
    - Offer coronary angiography with rescue PCI as indicated.

Contraindications to Fibrinolysis:

Absolute contraindications [16,17] [**L2**]:

- Aortic dissection.
- Previous intracranial haemorrhage or stroke of unknown origin at any time.
- Ischaemic stroke in the preceding 6 months.
- Central nervous system damage, neoplasm, or arterio-venous malformation.
- Recent major trauma/surgery/head injury – within preceding 3 weeks.
- GI bleeding within the past month.
- Known bleeding disorder – excluding menses.
- Non-compressible punctures in the past 24 hours, e.g. femoral vein, liver biopsy, lumbar puncture.

Relative contraindications [16,17] [**L2**]:

- Transient ischaemic attack (TIA) in the preceding 6 months.
- Oral anticoagulant therapy.
- Pregnancy or within 1 week postpartum.
- Refractory hypertension:
  - Systolic BP ≥180 mmHg; and/or
  - Diastolic BP ≥110 mmHg.
- Advanced liver disease.
- Infective endocarditis.
- Active peptic ulcer.
- Prolonged or traumatic resuscitation**.**

10.2 Medical Therapy When Reperfusion is Not Appropriate

Consider medical therapy when reperfusion therapy (PCI, CABG, or fibrinolysis) is not appropriate [18] [**L2**].

Antiplatelets [8,18] :

- Offer aspirin to all patients and continue indefinitely unless they are intolerant.
- Offer dual antiplatelet therapy with a $P2Y_{12}$ inhibitor for 1 year in all patients who have had a STEMI, irrespective of whether they have undergone reperfusion therapy.

11 Management of NSTEMI and Unstable Angina

11.1 Risk Assessment

Use either of the following risk scoring systems to determine appropriateness for further investigations and intervention:

- Thrombolysis In Myocardial Infarction (TIMI) risk score [6] .
- Global Registry of Acute Coronary Events (GRACE) risk score [7] .

TIMI Score [6] :

- Estimates the likelihood of ischaemic events or death at day 14 in patients with NSTE-ACS.
- Each of the following constitutes one point of the score:
    - Age ≥65 years.
    - Three or more risk factors for coronary artery disease (CAD):
        - Family history of CAD.
        - Hypertension.
        - Hypercholesterolemia.
        - Diabetes mellitus.
        - Tobacco use.
    - Known CAD (stenosis >50%).
    - Aspirin use in the past 7 days.
    - Severe angina (≥2 episodes in 24 hours).
    - ST deviation ≥0.5 mm.
    - Elevated cardiac marker level.

Risk at day 14 of death, new or recurrent MI or severe recurrent ischaemia, by TIMI score [6] :

- 0-1: 5%.
- 2: 8%.
- 3: 13%.
- 4: 20%.
- 5: 26%.
- 6-7: 41%.

Patients scoring at least 1 point on the TIMI score should be further risk assessed using the GRACE score. Urgent revascularisation should be considered earlier in patients with higher risk scores [3] .

GRACE Risk Score [3,5,7] :

- Assesses the percentage risk of death in hospital and at 6 months.
- Considers the following factors:
    - Age.
    - Killip class:
        - 1 – No evidence of heart failure.
        - 2 – Mild to moderate heart failure
          (3rd heart sound, rales over ≤1/3 of lung fields, raised JVP).
        - 3 – Overt pulmonary oedema.
        - 4 – Cardiogenic shock.
    - Heart rate.
    - Systolic blood pressure.
    - Serum creatinine.
    - ST-segment deviation.
    - Cardiac arrest at admission.
    - Elevated serum cardiac enzymes.

GRACE Risk Stratification [7] :

- Lowest risk: ≤1.5%.
- Low risk: 1.5% - 3.0%.
- Intermediate risk: 3.0% - 6.0%.
- High risk: 6.0% - 9.0%.
- Highest risk: >9.0%.

11.2 Intermediate and High-Risk Patients

For intermediate and high-risk patients offer [3,5] :

- Coronary angiography with follow on PCI
  - As soon as possible if the patient is clinically unstable [3,22] [**L2**].
  - Within 24 hours of first admission if there are no contraindications [22] [**L2**].
- CABG [5] :
  - Usually reserved for patients with:
    - Extensive disease (three or more vessels) or diffuse disease – especially if associated with poor left ventricular function.
    - Significant narrowing of the left main stem coronary artery, which is not suitable for PCI.

11.3 Low Risk Patients

For low-risk patients, offer:

- Conservative management with dual antiplatelet therapy without early coronary angiography [3,5] [**L1, RGA**]:
- Non-invasive imaging:
  - Consider in patients who have been conservatively managed and who have not had coronary angiography [3,5] [**L2**] with:
    - Myocardial perfusion scintography.
    - Stress echocardiography.
    - Perfusion MRI.
    - Multidetector CT angiography.
- If ischaemia is demonstrated or experienced, offer coronary angiography with follow-on PCI [3,5] .

12 Additional Pharmacotherapies for ACS

All patients with ACS should be offered treatment with the following medications following initial stabilisation [3,8] [**L1**]:

- Dual antiplatelet therapy.
- ACE inhibitor.
- Beta-blocker.
- Statin.
- Anticoagulation may also be appropriate.

12.1 Dual Antiplatelet Therapy

Offer all patients dual antiplatelet therapy [3,5,8] [**L1**]:

- Aspirin [3,8] :
  - Offer to all patients with ACS [8] [**L1**].
  - Is to be continued indefinitely unless intolerant or indicated for anticoagulation.
  - If the patient is allergic, clopidogrel monotherapy may be used [3,8] [**L3, RGA**].
- The following antiplatelet agents can be used for up to 12 months in combination with aspirin [8,24,25] [**L1**]:
  - Clopidogrel.
  - Ticagrelor.
- Consider co-prescribing a proton pump inhibitor for patients at high risk of GI adverse effects [2] [**L1, RGA**].

12.2 ACE Inhibitors

ACE inhibitors should be offered within 24 hours (and continued indefinitely) to all patients with ACS and any of the following, unless contraindicated [3] :

- Anterior infarction.
- Heart failure or left ventricular ejection fraction (LVEF) of <0.40.
- If the patient is intolerant to an ACE inhibitor, use an angiotensin-receptor blocker (ARB) instead [8] [**L1**].

12.3 Beta-Blockers

Beta-blockers should be offered within 24 hours, when the patient is haemodynamically stable, and to patients who do **not** have any of the following [3] [**L1**]:

- Signs of heart failure.
- Evidence of a low-output state.
- Increased risk of cardiogenic shock.
- Other contraindications to beta-blockade.

12.4 Statin Therapy

A high-intensity statin should be used in all patients and continued indefinitely [26] :

- Start statin treatment with atorvastatin 80 mg.
- If a patient is intolerant to a high-intensity statin:
    - Aim to treat with the maximum tolerated dose.
    - Seek specialist advice for treating people who are intolerant to three different statins.

13 Cardiac Rehabilitation

Patients who have had a MI should be enrolled in a system of well-structured cardiac rehabilitation or secondary prevention programme [2] [**L1**].

Cardiac Rehabilitation programmes:

- The care plan and interventions should be individualized as per the patient's preference and needs.
- Should begin as soon as possible after admission and before discharge from hospital [8] [**L1**]:
    - Continues with structured programmes in the community for approximately 12 weeks [9] .
- Should be designed to motivate patients to attend and complete the programme [8] [**L1**].
- Partners and/or carers should be involved in cardiac rehabilitation if the patient wishes them to be [8] [**L1**].

Exercise training should form a core element of cardiac rehabilitation programmes [5,8] [**L2**].

- Should be offered at least twice a week for a minimum of 8 weeks.
- Low-to-moderate risk patients can undergo exercise training in home and community settings.
- High-risk patients and those who require high-intensity exercise require hospital-based programmes, or those in a venue with full resuscitation facilities.

14 Follow Up in Primary Care

14.1 Patient Education and Advice

Provide the patient with information and advice, including [5,8] [**L3, RGA**]:

- Results of investigations and confirmation of the diagnosis.
- Follow-up arrangements and future management plans.
- Management of ASCVD risk factors, including the importance of:
    - Lifestyle improvement, including smoking cessation.
    - Glycaemic control.
    - Blood pressure control.
    - Physical activity.
- Pharmacotherapies for secondary prevention.
- Cardiac rehabilitation, where applicable.
- Identify and address health beliefs and the patient's specific illness perceptions and correct any misconceptions.

See also the MOPH National Guideline for *Atherosclerotic cardiovascular disease risk assessment management* [27] .

14.2 Further Advice and Assessment

Returning to Work:

- Consider the physical and psychological status of the patient and the nature of their work and work environment before providing advice [8] [**L1**].
- Return to work date [11] :
    - Patients with jobs involving minimal activity often return to work in 2-3 weeks.
    - More physically demanding jobs can often be resumed in 4-6 weeks, unless significant ischaemia is present.

Sexual Activity:

- If the patient has made an uncomplicated recovery following an MI, advise them that they can resume sexual activity when they can complete 5 estimated metabolic equivalents of task (METS) of workload without symptoms. This may be gauged by the patient's ability to climb two flights of stairs, or a low threshold exercise tolerance test (ETT) [**R-GDG**].
- For men with erectile dysfunction [8] [**L1**]:
    - Consider a phosphodiesterase type 5 (PDE5) inhibitor if:
        - The MI was more than 6 months ago; and
        - The patient is now stable.
    - PDE5 inhibitors are contraindicated in those treated with nitrates or nicorandil.

Psychological Intervention:

After an MI, approximately 15-45% of patients will experience psychological distress [28,29] :

- Persistent significant anxiety or depressions should be considered for treatment.
- Screen patients for anxiety and depression using a validated assessment tool:
    - Screening should be performed at:
        - Discharge from hospital and 6-12 weeks post-MI.
        - Following a decision on surgical intervention.
        - Repeated at 3 monthly intervals, if appropriate.
- Cognitive behavioural therapy is the treatment of choice for cardiac rehabilitation patients with anxiety or depression [29].

15 Key Considerations for Patient Preferences

Patient preferences refer to patient perspectives, beliefs, expectations, and goals for health and life, and to the steps employed by individuals in assessing the potential benefits, harms, costs, and limitations of the management options in relation to one another. Patients may have preferences when it comes to defining their problems, identifying the range of management options and selecting or ranking the outcomes used to compare these options.

It is important for healthcare professionals to develop an understanding of the patient as an individual and the unique way in which each person experiences a condition and its impact on their life.

The following recommendations are therefore made for physicians and other healthcare professionals regarding general principles of patient care in Qatar:

- **Respect Patients:** Treat patients with respect, kindness, dignity, courtesy and honesty. Ensure that the environment is conducive to discussion and that the patient's privacy is respected, particularly when discussing sensitive, personal issues. Ask the patient how they wish to be addressed and ensure that their choice is respected and used.

- **Maintain Confidentiality:** Respect the patient's right to confidentiality and avoid disclosing or sharing patients' information without their informed consent. In this context, students and anyone not directly involved in the delivery of care should first be introduced to the patient before starting consultations or meetings, and let the patient decide if they want them to stay.

- **Clarify Third-Party Involvement:** Clarify with the patient at the first point of contact whether and how they like their partner, family members or carers to be involved in key decisions about their care or management and review this regularly. If the patient agrees, share information with their partner, family members or carers.

- **Obtain Informed Consent:** Obtain and document informed consent from patients, in accordance with MOPH policy and guidance.

- **Encourage Shared Decision Making:** Ensure that patients are involved in decision making about their own care, or their dependent's care, and that factors that could impact the patient's participation in their own consultation and care including physical or learning disabilities, sight, speech or hearing impairments and problems with understanding, reading or speaking English are addressed.

- **Disclose Medical Errors:** Disclose errors when they occur and show empathy to patients.

- **Ensure Effective Communication:** Explore ways to improve communication including using pictures, symbols or involving an interpreter or family members. Avoid using medical jargon. Use words the patient will understand and confirm understanding by asking questions.

- **Ensure Continuity of Care:** Provide clear and timely sharing of patient information between healthcare professionals especially at the point of any transitions in care.

16 Performance Measures

A list of performance measures is given in the table below. Healthcare organisations are encouraged to monitor service performance using the indicator definitions below [30] .

Number	Numerator	Denominator
ACS01	Number in the denominator whose time form hospital arrival to fibrinolysis is 30 minutes or less	Total number of adult patients, seen in the last 12 months, with acute myocardial infarction with ST-segment elevation on the ECG closest to hospital arrival time, who received fibrinolytic therapy during the hospital stay.
ACS02	Number in the denominator, whose time from arrival to primary PCI is 90 minutes or less.	Total number of adult patients, seen in the last 12 months, with acute myocardial infarction with ST-segment elevation on the ECG closest to hospital arrival time, who undergo primary percutaneous coronary intervention (PCI) during hospital stay.
ACS03	Number in the denominator, who die within 30 days of the procedure.	Total number of adult patients, seen in the last 12 months, who have undergone primary PCI or CABG for acute myocardial infarction.

Table 16.1: Performance measures[30].

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Appendix: Detailed Description of the Literature Search

A systematic search for existing literature on acute coronary syndrome was performed in the period June 10th – June 24th, 2020.

All existing references were evaluated and where necessary and applicable, the latest version of the specific manuscript was used to update the guideline and replace the older reference. The search for clinical practice guidelines on acute coronary syndrome management was performed in the *PubMed* database and websites of relevant organisations and societies including the *UK NICE*, the *Supreme Council of Health (Qatar),* and the *Institute for Clinical Systems Improvement*. The present guideline is primarily based on *UK NICE*, the *European Society for Cardiology,* the *American College of Cardiology/American Heart Association* and the *Scottish Intercollegiate Guidelines Network* guidelines and is supplemented with other relevant studies.

Peer-reviewed scientific publications were found in PubMed and via *Google Scholar* Internet search engine. Non-peer reviewed studies were identified in *bioRxiv*. Books were checked on *Amazon* and via *Google* and *Google Scholar* search engines.

The included publications were identified using the terms "*Coronary Syndrome*" and specified with the following terms in combinations:

Guideline, acute, adult, definition, prevalence, epidemiology, risk, assessment, investigation, diagnosis, differential, emergency, chest, pain, ECG, Troponin, STEMI, NSTEMI, ASCVD, CAD, management, opoid, GTN, antiplatelet, oxygen, anticoagulant, PCI, angiography, fibrinolysis, TIMI score, GRACE score, ACE inhibitor, statin, beta blocker, aspirin, clopidogrel, side effects, rehabilitation, advice, exercise, referral, specialist, follow-up.

Figure A.1 on the next page demonstrates graphically the results of the search and application of exclusion criteria.

View Pathway

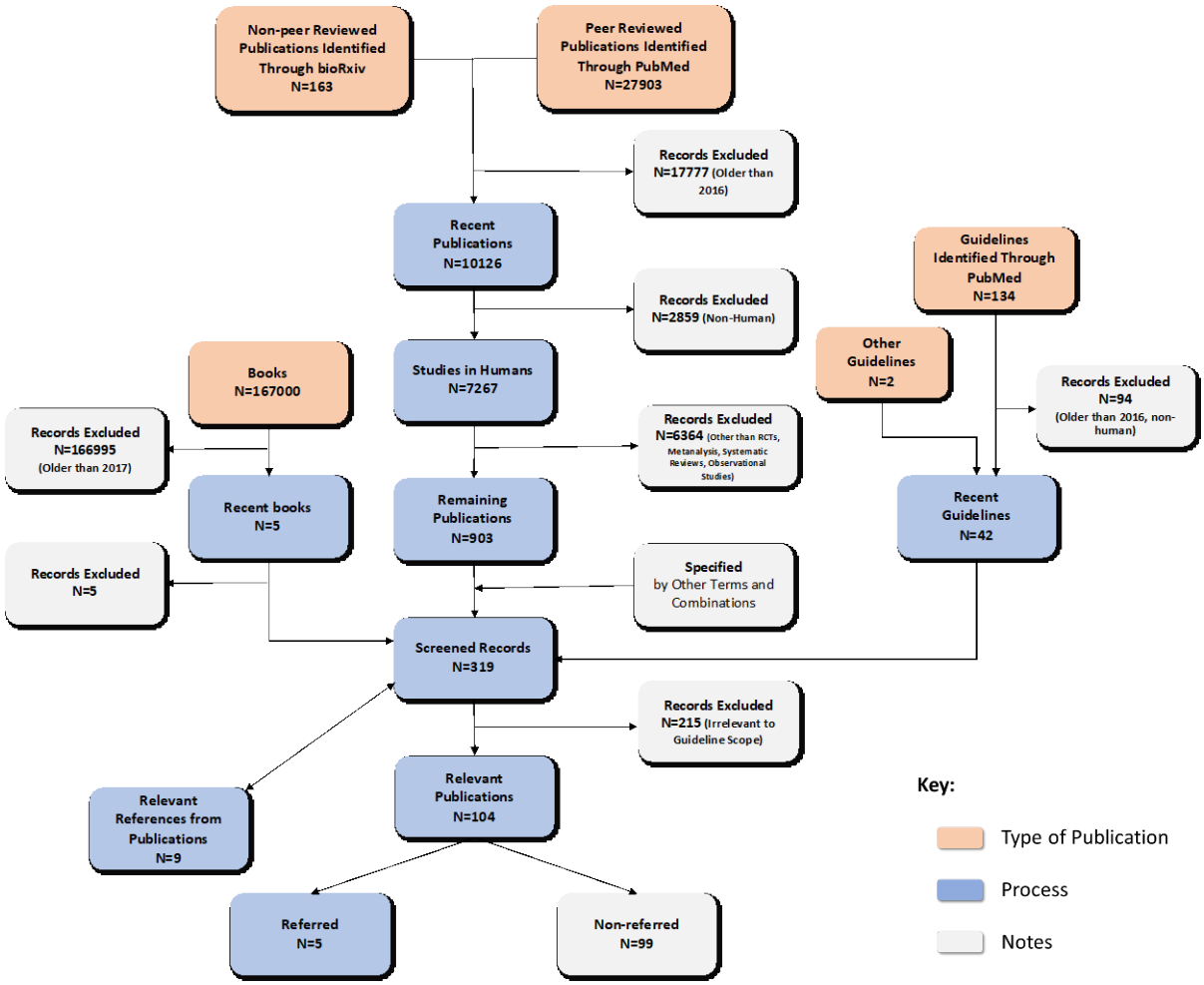

Fig A.1: Literature search results and application of exclusion criteria.

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