NATIONAL CLINICAL GUIDELINES

THE ASSESSMENT & MANAGEMENT OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN ADULTS

Ministry of Public Health
P.O. Box 42,
Doha, Qatar
Phone: (+974)4 407 0969
Email: clinicalguidelines@moph.gov.qa

Valid From: 15th June 2020
Date of Next Revision: 15th June 2022

المبادئ الإرشادية السريرية لدولة قطر
NATIONAL CLINICAL GUIDELINES FOR QATAR

وزارة الصحـــــة العامـــــة
Ministry of Public Health
State of Qatar • دولـــة قطـــر

View Pathway

Version History

Version	Status	Date	Editor	Description
1.0	Final	19th March 2017	Guidelines Team	Final Version for Publication
2.0	Final	15th June 2020	Guidelines Team	Final Version for Publication.

Citation

Suggested citation style:

Ministry of Public Health Qatar. National Clinical Guideline: The Assessment and Management of Chronic Obstructive Pulmonary Disease in Adults (2020).

Abbreviations

The abbreviations used in this guideline are as follows:

ACOS	Asthma-COPD overlap syndrome
ABG	Arterial blood gas
AMP	Adenosine monophosphate
BMI	Body mass index
CAT	COPD Assessment Test
CBC	Complete blood count
COPD	Chronic obstructive pulmonary disease
CT	Computed tomography
ECG	Electrocardiogram
FEV_1	Forced expiratory volume in 1 second
FVC	Forced vital capacity
GOLD	Global Initiative for Chronic Obstructive Lung Disease
HFNT	High-flow Nasal Therapy
ICS	Inhaled corticosteroid
ICU	Intensive care unit
IL	Interleukin
IPPB	Intermittent positive pressure breathing
IV	Intravenous route
LABA	Long-acting beta2-agonist

View Pathway

LAMA	Long-acting muscarinic antagonist
LTOT	Long term oxygen therapy
MOPH	Ministry of Public Health of Qatar
MRC	Medical Research Council
NIV	Non-invasive ventilation
$PaCO_2$	Partial pressure of carbon dioxide dissolved in arterial blood
PaO_2	Partial pressure of oxygen dissolved in arterial blood
PCV13	13-valent pneumococcal conjugate vaccine
PPSV23	23-valent pneumococcal polysaccharide vaccine
SABA	Short-acting beta2-agonist
SAMA	Short-acting muscarinic antagonist
SpO_2	Oxygen saturation by pulse oximetry
TB	Tuberculosis
T_LCO	Transfer factor for carbon monoxide

View Pathway

Table of Contents

View Pathway

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 chronic obstructive pulmonary disease (COPD) in adults. The objective is to improve the appropriateness of investigation, prescribing and referral of patients presenting to provider organisations in Qatar. It is intended that the guideline will be used primarily by physicians in primary care and outpatient settings.

1.2 Scope of the Guideline

Aspects of care covered within this guideline include:

- Early detection, assessment, diagnosis, and management of chronic obstructive pulmonary disease (COPD) in adults.
- Management in primary and secondary care, and criteria for specialist referral.
- Principles of palliative care in COPD.

Aspects of care not covered within this guideline are:

- Children and adolescents.
- Prescribing and advice for smoking cessation.

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 Ameena Ibrahim Fakhroo	Senior Consultant Family Medicine, Manager of Healthcare	Primary Health Care Corp
Dr Abdul Hakeem Hamza	Senior Consultant Family Medicine	Primary Health Care Corp
Dr Ismail Mobarak	Consultant Pulmonologist	Al Emadi Hospital
Dr Mohamed El Nazer	Consultant Pulmonologist	Al Ahli Hospital
Dr Azza Abu El Rish	Family Physician	Qatar Petroleum
Dr Hisham Abdul Aleem Abdul Sattar	Consultant Pulmonologist, Chief of Pulmonary/Allergy/Sleep Medicine & Thoracic Surgery Division	Hamad Medical Corporation
Dr Hassan Sawaf	Consultant Pulmonologist and Intensivist	Al Ahli Hospital
Dr Sakir Thurempurath	Family Physician	Aster Medical Centre

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 of Strategic Planning & Performance Department	Ministry of Public Health
Shk Dr Mohammed Hamad J. Al Thani	Co-Chair of the 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
Dr Abi Khalil Charbel	Associate Professor of Medicine Consultant Cardiology	Weill Cornell Medicine-Qatar
Dr Paul Dijkstra	Director of Medical Education	Aspetar
Dr Mohamed Elrishi	Consultant Endocrinology and Internal Medicine	Al Ahli Hospital
Dr Dahlia Mustafa Hassan	Consultant Family Medicine	Primary Health Care Corp
Dr Ghassan Youseph Hommos	Consultant Endocrinology	Al Emadi Hospital
Dr Chris Kenny	Executive Director Clinical and Service Development, Office of the Chief Medical Officer	Hamad Medical Corporation
Dr Egon Toft	VP and Dean	College of Medicine, Qatar University

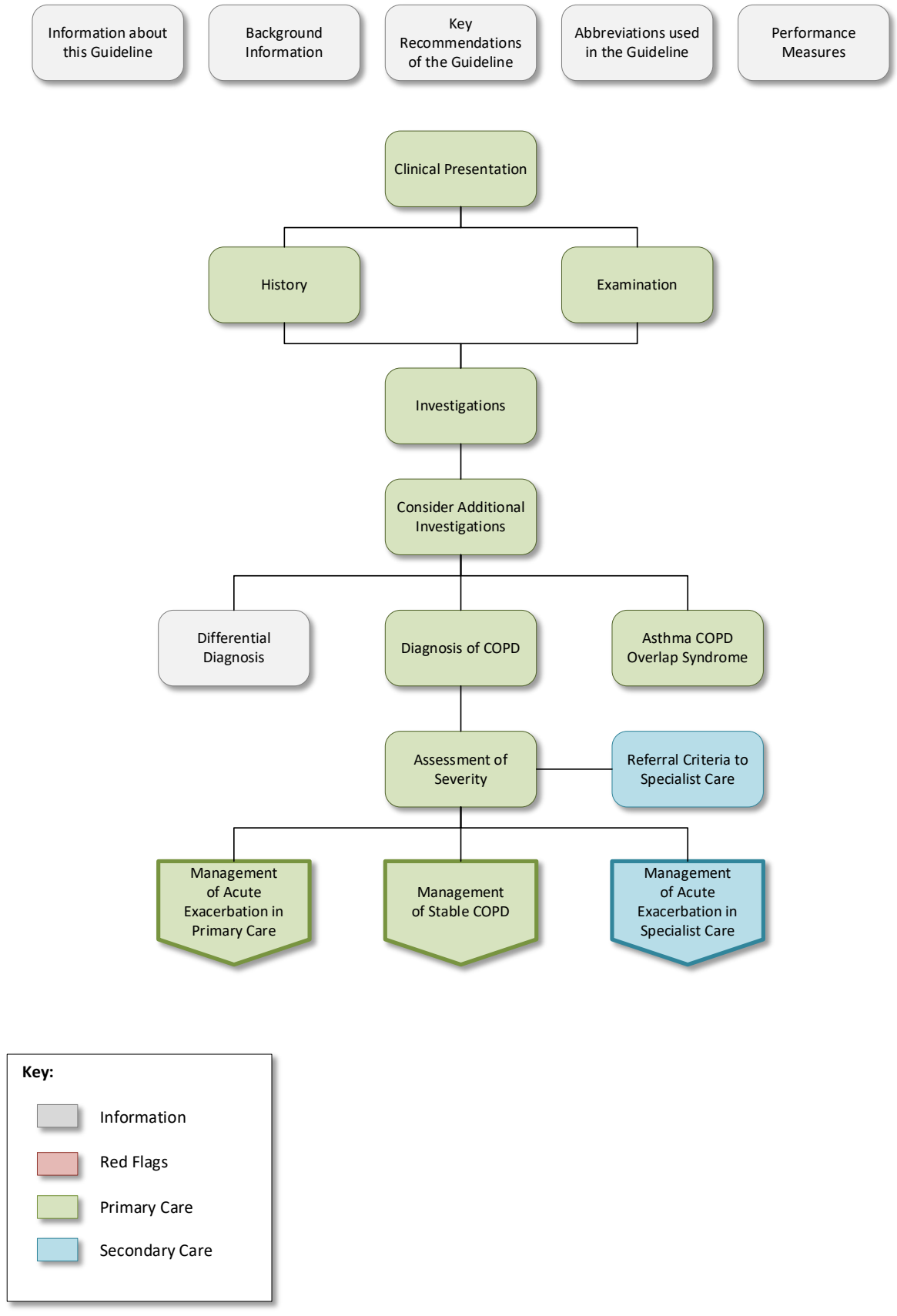
1.8 Responsibilities of Healthcare Professionals

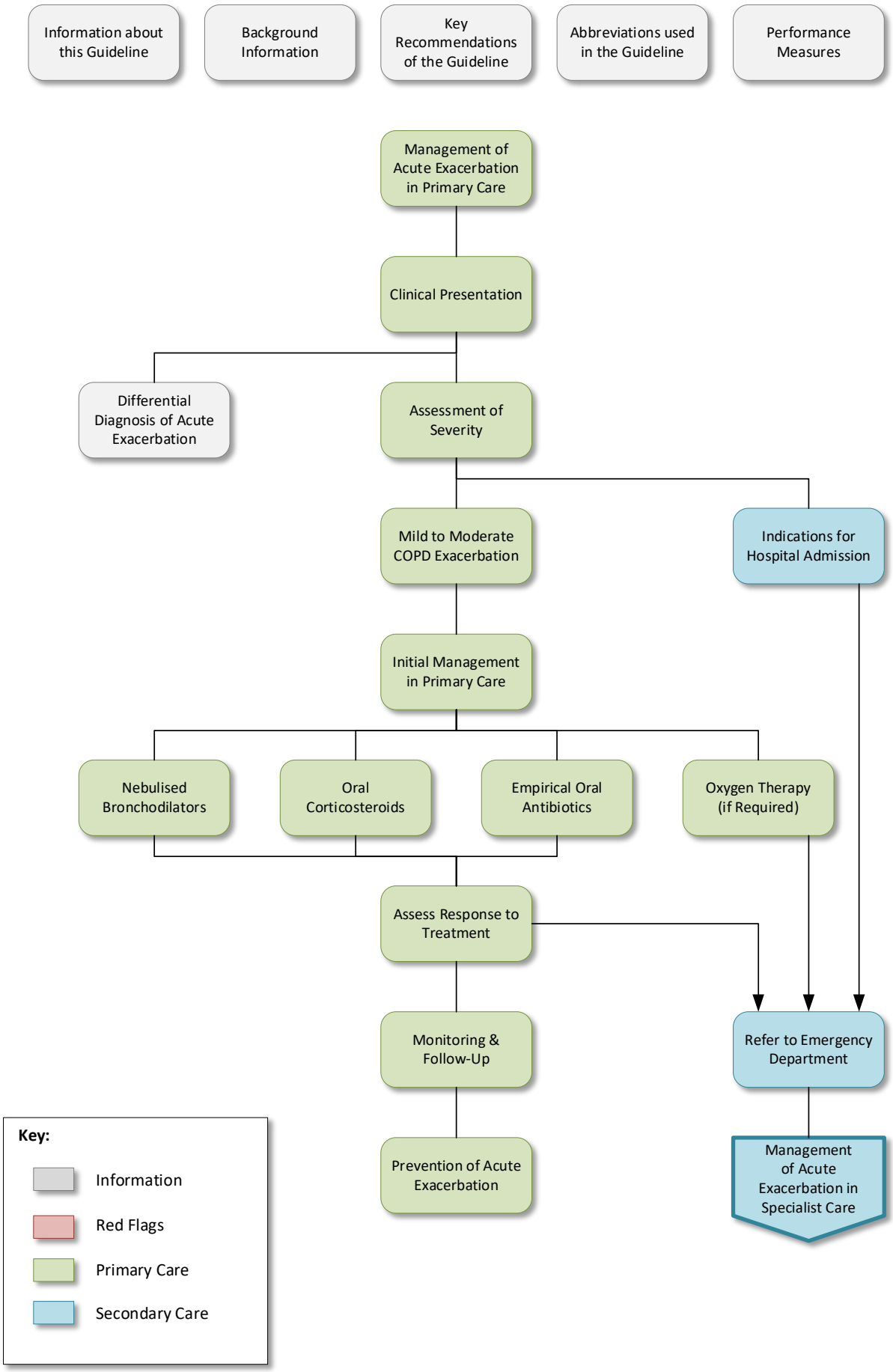
This guideline has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising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

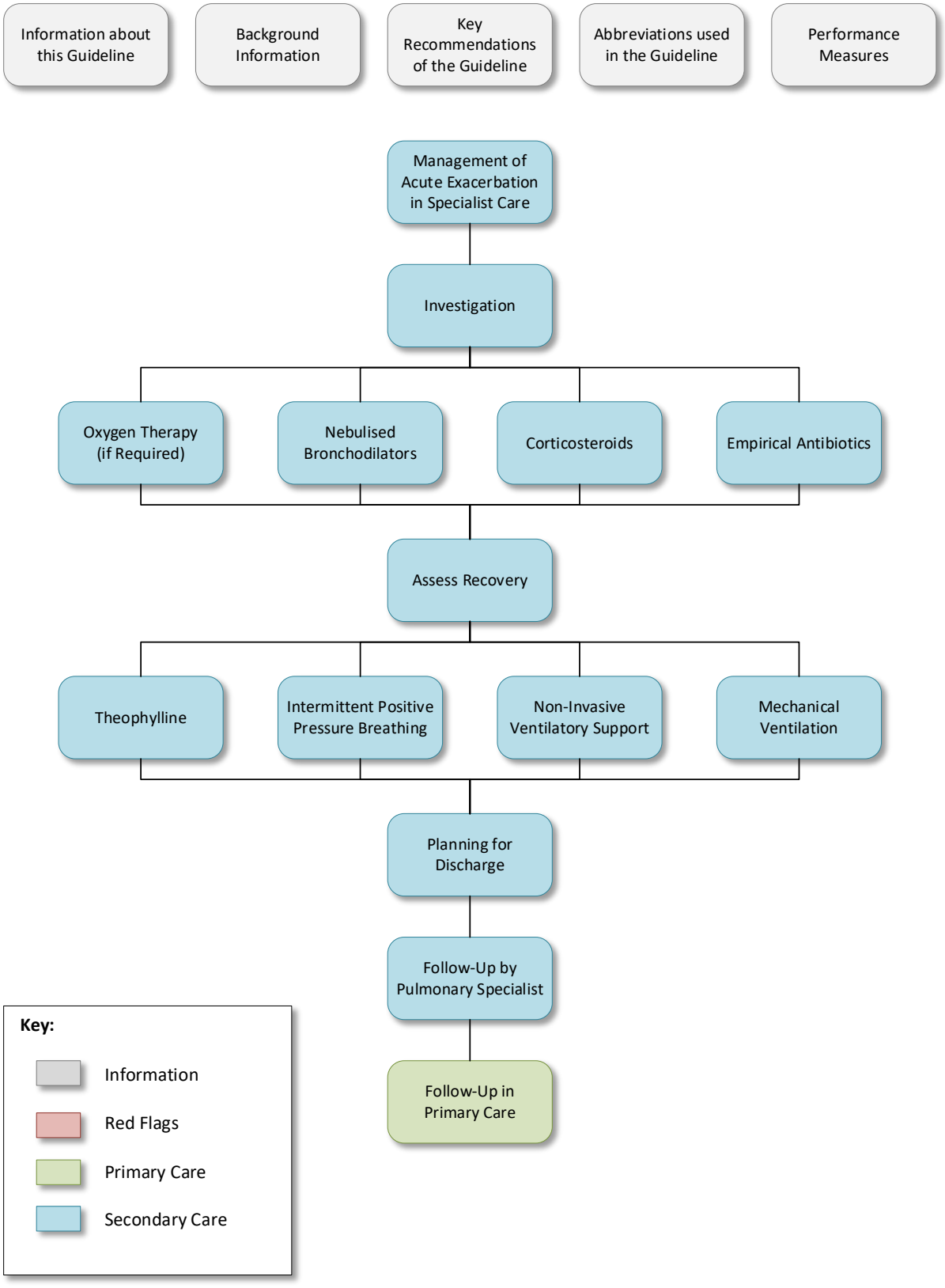
The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or caregivers and should consider the individual risks and benefits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

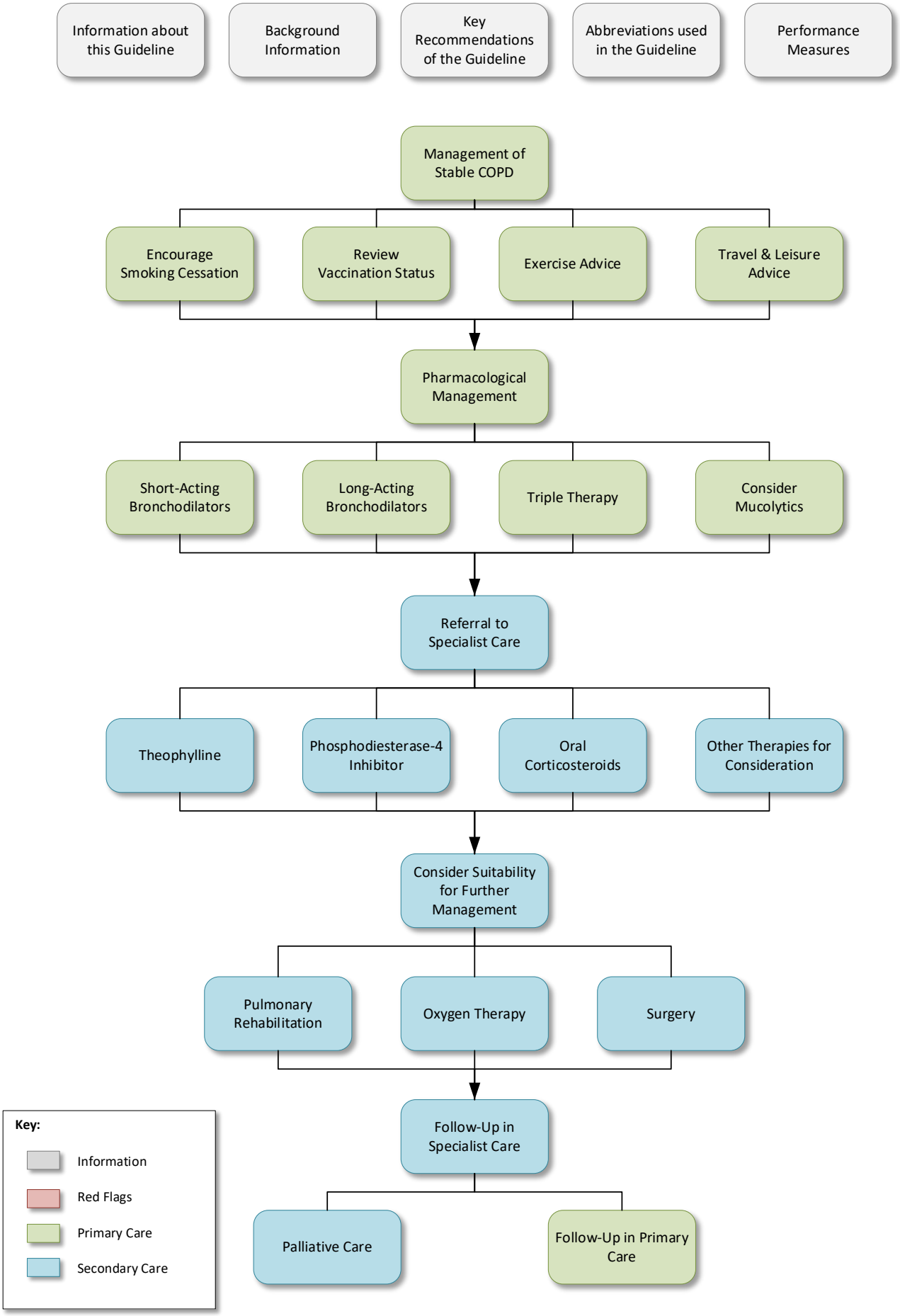
2 COPD Management Pathway

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




Information about this Guideline
Background Information
Key Recommendations of the Guideline
Abbreviations used in the Guideline
Performance Measures
Management of Acute Exacerbation in Primary Care
Clinical Presentation
Differential Diagnosis of Acute Exacerbation
Assessment of Severity
Mild to Moderate COPD Exacerbation
Indications for Hospital Admission
Initial Management in Primary Care
Nebulised Bronchodilators
Oral Corticosteroids
Empirical Oral Antibiotics
Oxygen Therapy (if Required)
Assess Response to Treatment
Monitoring & Follow-Up
Refer to Emergency Department
Prevention of Acute Exacerbation
Management of Acute Exacerbation in Specialist Care
Key:
Information
Red Flags
Primary Care
Secondary Care


Information about this Guideline
Background Information
Key Recommendations of the Guideline
Abbreviations used in the Guideline
Performance Measures
Management of Acute Exacerbation in Specialist Care
Investigation
Oxygen Therapy (if Required)
Nebulised Bronchodilators
Corticosteroids
Empirical Antibiotics
Assess Recovery
Theophylline
Intermittent Positive Pressure Breathing
Non-Invasive Ventilatory Support
Mechanical Ventilation
Planning for Discharge
Follow-Up by Pulmonary Specialist
Follow-Up in Primary Care
Key:
Information
Red Flags
Primary Care
Secondary Care


Information about this Guideline
Background Information
Key Recommendations of the Guideline
Abbreviations used in the Guideline
Performance Measures
Management of Stable COPD
Encourage Smoking Cessation
Review Vaccination Status
Exercise Advice
Travel & Leisure Advice
Pharmacological Management
Short-Acting Bronchodilators
Long-Acting Bronchodilators
Triple Therapy
Consider Mucolytics
Referral to Specialist Care
Theophylline
Phosphodiesterase-4 Inhibitor
Oral Corticosteroids
Other Therapies for Consideration
Consider Suitability for Further Management
Pulmonary Rehabilitation
Oxygen Therapy
Surgery
Follow-Up in Specialist Care
Palliative Care
Follow-Up in Primary Care
Key:
Information
Red Flags
Primary Care
Secondary Care

View Pathway

3 Key Recommendations of the Guideline

The key recommendations of this guideline are:

Diagnosis:

- The number of premature deaths from COPD can be reduced through early accurate diagnosis and appropriate treatment[1].
- If COPD is diagnosed at a later phase, there is strong association with number of hospital admissions or exacerbations[1].

Spirometry:

- Is essential for the assessment of patients with suspected COPD [2,3].
- Should be made available to all primary care clinics and all outpatient clinics where COPD patients are managed [**R-GDG**].

Management of Stable COPD:

- The management of COPD should be delivered by a multidisciplinary service [3] [**L3, RGA**].
- When managing a patient with COPD, consider all of the following [3]:
    - Health and preventative measures.
    - Pharmacological treatment.
    - Pulmonary rehabilitation.
    - Oxygen therapy.
    - Surgery.
    - Palliative care.

Pharmacological Treatment:

- Use a short-acting bronchodilator using the most appropriate device (e.g. inhaler, spacer, or nebuliser) as needed for the relief of symptoms [3] [**L1, RGA**].
- Long-acting bronchodilators should be offered to patients with confirmed, stable COPD who continue to have respiratory symptoms [4] [**L1, RGA**].
    - Offer one of the following [3] [**L1, RGA**]:
        - Long-acting beta2-agonist (LABA) alone; or
        - Long-acting muscarinic antagonist (LAMA) alone; or
        - Both a LABA and a LAMA in a combination inhaler.
- If patient remains breathless or has frequent exacerbations, consider [3]:
    - LAMA plus LABA; with an inhaled corticosteroid (ICS).
    - LAMA and LABA plus an ICS in a combination inhaler [3] [**L1, RGA**].
    - Consider referral to a pulmonologist for specialist advice if triple therapy is being considered [**R-GDG**].
- Consider mucolytics in patients with chronic productive cough and continue if there is symptomatic improvement [3] [**L1, RGA**].
- Consider theophylline in patients who have already tried long-acting bronchodilators but who are unable to use inhaled therapy [3] [**L2, RGA**].
    - Only offer theophylline after consultation with a pulmonologist [3].
- Consider a phosphodiesterase-4 inhibitor in addition to triple inhaler therapy, in cases where chronic bronchitis is the predominant feature with a history of exacerbations [2,4].
    - Only offer after consultation with a pulmonologist [**R-GDG**].

Pulmonary Rehabilitation:

- Pulmonary rehabilitation should be offered to patients with COPD [4] [**L1, RGA**], including:
    - Those who have had a recent hospitalisation for an acute exacerbation [3] [**L1, RGA**].
    - Those who have self-reported exercise limitation [5] [**L2**].

Long Term Oxygen Therapy:

- Long term oxygen therapy (LTOT) is indicated in [2,3,6–8]:
    - Patients with $PaO_2 \leq 7.3$ kPa (55 mmHg) when stable; or
    - $PaO_2 \leq 8$ kPa (60 mmHg) when stable, plus one of the following [2,3,8] [**L1**]:
        - Secondary polycythaemia − haematocrit ≥ 55%.
        - Nocturnal hypoxaemia.
        - Peripheral oedema.
        - Pulmonary hypertension.

Long Term Non-Invasive Ventilation:

- Long-term non-invasive ventilation (NIV) at a specialist centre should be considered for the following [3,8,9] :
    - Patients with chronic hypercapnic respiratory failure in whom assisted (invasive or non-invasive) ventilation was required during an exacerbation.
    - Patients who are hypercapnic ($PaCO_2 > 6$ kPa (45 mmHg)) or acidotic (blood pH < 7.35) whilst on LTOT.
    - Patients with chest wall or neuromuscular disease causing hypercapnic respiratory failure:
        - Additional LTOT may be required in case of hypoxaemia not corrected with NIV.

Management of Acute Exacerbations of COPD:

- Increase frequency of bronchodilator therapy [3].
- Consider starting treatment with oral corticosteroids [3] [**L1, RGA**].
- Start oral antibiotics if indicated [3,4,10] [**L1, RGA**].
- Commence oxygen therapy using a 28% Venturi mask at 4 L/min in pre-hospital care and aim to maintain SpO_2 at 88–92%.
- Consider intermittent positive pressure breathing (IPPB) in patients experiencing acute exacerbations who are too tired or weak to clear secretions through effective coughing [6].
- Non-invasive ventilation:
    - Should be considered [3,4,11,12] :
        - For all patients with an acute exacerbation of COPD with respiratory acidosis (arterial pH ≤ 7.35 and/or $PaCO_2 \geq 6$kPa (45 mmHg)).
        - Within the first 60 minutes of hospital arrival if respiratory acidosis persists despite treatment.
        - To support weaning from invasive mechanical ventilation and earlier extubation of patients with COPD [4] [**L1, RGA**].
- Consider mechanical ventilation for patients who [3] :
    - Do not respond adequately to NIV and require intubation and ventilation.
    - As the first-line management option for patients with multiple organ system impairment or reduced level of consciousness.

4 Background information

4.1 Definitions

Chronic Obstructive Pulmonary Disease (COPD):

- COPD is a disease of the lung characterised by airway obstruction, which is [2,3,6,13] :
    - Usually progressive.
    - Not fully reversible.
    - Does not change over several months.
    - Due to a combination of airway and parenchymal damage.
    - Usually associated with a chronic inflammatory response in the airways and the lung to noxious particles or gases.

Airway Obstruction:

- Airway obstruction is defined as a post-bronchodilator forced expiratory volume in 1 second (FEV_1)/forced vital capacity (FVC) ratio of < 0.7 [3] .

Asthma-COPD Overlap Syndrome:

- Asthma-COPD Overlap Syndrome (ACOS) is characterised by:
    - Persistent airflow limitation with several features associated with asthma and others associated with COPD [2] .

Exacerbation of COPD:

- An exacerbation of COPD is defined as [2,3] :
    - A sustained worsening of symptoms from a usual stable state, beyond normal daily variations.
    - Acute in onset.
    - Requires a change in regular medication.

Respiratory Failure:

- Respiratory failure is defined as [3] :
    - Failure to maintain adequate gas exchange – characterised by abnormalities of arterial blood gas tensions.
    - PaO_2 < 8.0 kPa (60 mmHg), with or without $PaCO_2$ > 6.7 kPa (50 mmHg).

4.2 Epidemiology

The incidence and prevalence of COPD in Qatar is not known at present. However, the 2012 Qatar STEPwise Survey found the prevalence of smoking amongst respondents was 16.4% [14] :

- 31.9% in males.
- 1.2% in females.

In Qatar in 2013, 6.2% of deaths were due to respiratory causes [14] :

- 8.5% of deaths in the Qatari population.
- 4.9% of the deaths in the non-Qatari population.

4.3 Risk Factors for COPD

Risk factors for COPD include [1–3,15] :

- Male gender.
- Smoking:
    - Amongst people who smoke cigarettes, there is a greater:
        - Prevalence of respiratory symptoms and lung function abnormalities.
        - Annual decline in FEV_1.
        - COPD mortality rate than non-smokers.
- Occupational exposure, e.g. dusts from organic or inorganic substances, chemical agents, and fumes.
- Increasing age.
- Lower socioeconomic status.
- $Alpha_1$-antitrypsin deficiency − accounts for < 1% of cases.
- Environmental factors, e.g. air pollution from burning of wood, biomass fuels, coal, or incense (e.g. bukhoor) [**R-GDG**].
- A history of recurrent respiratory infections in childhood have also been associated with reduced lung function in adulthood [**R-GDG**].

View Pathway

5 Clinical Presentation

Patients with early stage COPD may be asymptomatic or present with minimal symptoms[3]. Even if asymptomatic, airflow limitation may be present[3].

The clinical presentation of COPD includes the following, which varies from day-to-day and individually[2,3]:

- Chronic and progressive breathlessness on exertion.
- Cough.
    - May be intermittent initially but later is present every day, often throughout the day, and may be non-productive.
- Sputum production.
- Wheeze.

Patients may also present with complications and/or comorbidities associated with COPD, including[2,3]:

- Respiratory:
    - Frequent respiratory infections.
    - Bronchiectasis.Obstructive sleep apnoea.
    - Pulmonary hypertension.
    - Respiratory failure.
    - Lung cancer – a 2.8-fold increase in mild-moderate patients with a history of smoking.
- Cardiac:
    - Cor pulmonale.
    - Atrial fibrillation.
    - Hypertension.
    - Heart failure.
- Metabolic:
    - Metabolic syndrome and diabetes.
    - Abnormal body mass index (BMI).
- Haematological:
    - Anaemia.
    - Polycythaemia.
- Musculoskeletal:
    - Osteoporosis.
- Gastrointestinal:
    - Gastro-oesophageal reflux disease.
- Psychological:
    - Depression and anxiety.
- Neurological:
    - Impaired cognitive function.

Co-morbidities may be independent of COPD or related by cause or risk factors [2] .

6 History

A comprehensive patient history should assess the following [2–4] :

- Symptoms, including:
    - Chronic and progressive breathlessness on exertion.
    - Cough.
    - Sputum production.
    - Wheeze.
    - Weight loss.
    - Ankle swelling.
    - Fatigue.
    - Chest pain.
    - Haemoptysis.
        - Uncommon in COPD and should raise the possibility of an alternative diagnosis.
- Previous exacerbations or hospitalisation for respiratory disorders.
- Exposure to risk factors, e.g. smoking and number of pack years, type of occupation, or environmental exposures.
- Identification of associated comorbidities (see *Section 5*).
- Family history of COPD or other chronic respiratory disease.
- Family history of alpha1-antitrypsin deficiency.
- Impact on patient's life, e.g.:
    - Limitation of activity and effort intolerance.
    - Missed work and socioeconomic impact.
    - Effect on family routines.
    - Feeling of anxiety or depression.
    - Sexual activity.
- Available family and social support.

NB: Symptoms such as haemoptysis, cough, fatigue, shortness of breath, chest pain, weight loss, and appetite loss may also present in lung cancer [16] .

View Pathway

7 Examination

Some patients may have unremarkable examination findings, physical signs of airflow limitation are usually not present until there is significant impairment of lung function [2,3] .

On physical examination, the following signs may be present [2,3] :

- Cyanosis.
- Cachexia.
- Pursed-lip breathing.
- Use of accessory muscles of respiration.
- Hyperinflated chest.
    - Reduced crico-sternal distance.
- Wheeze or quiet breath sounds.
- Paradoxical movement of the lower ribs (Hoover's sign).
- Reduced cardiac dullness on percussion.
- Signs of cor pulmonale:
    - Peripheral oedema.
    - Raised jugular venous pressure.
    - A systolic parasternal heave.
    - Loud pulmonary second heart sound.
- Tricuspid regurgitation in pulmonary arterial hypertension.

Signs suggestive of hypercapnia include [2,3] :

- Bounding pulse.
- Flapping tremor.
- Impaired consciousness.

NB: Finger clubbing is not a characteristic feature of COPD – if present, it should prompt assessment to exclude lung cancer, mesothelioma, bronchiectasis, or idiopathic pulmonary fibrosis [16–18] .

View Pathway

8 Investigations for COPD

8.1 Initial Investigations

Spirometry:
Is essential for the assessment of patients with suspected COPD to:

- Establish the diagnosis.
  - The presence of a post-bronchodilator FEV_1/FVC ratio of < 0.7 confirms the presence of airflow limitation [2,3] [**L3, RGA**].
  - Severity of airflow limitation is measured by post-bronchodilator FEV_1.
  - If FEV_1 is ≥ 80% of the predicted normal, COPD should only be diagnosed if respiratory symptoms are present, e.g. breathlessness or cough[2,3].
  - Spirometry confirms chronic airflow limitation but is of limited value in distinguishing between asthma with fixed airway obstruction, COPD, and ACOS[2,3].
- Assess severity of disease.
- Assess response to medication.
- Monitor disease progression.

Spirometry should be:

- Made available to all primary care clinics and all outpatient clinics where COPD patients are managed [**R-GDG**].
- Performed after the administration of an adequate dose of an inhaled bronchodilator in order to minimise variability.
  - Measurements should be evaluated by comparison with reference values based on: Age, height, weight, sex and ethnicity[2,3] [**L3, RGA**].
- Performed in patients who are over 40 years old, are current or ex-smokers, and have a chronic cough.
- Performed at an earlier age if $alpha_1$-antitrypsin deficiency or other risk factors are present [**R-GDG**].

NB: Peak expiratory flow (PEF) measurement may underestimate the severity of obstruction.

Other initial investigations [2,3] :

- Pulse oximetry [3] [**L2**].
- Chest radiograph:
  - At the time of initial diagnostic evaluation, all patients should have a chest radiograph performed to exclude other pathologies [2,3] [**L2**].
  - See *Section 13.2* for investigations performed during an acute exacerbation of COPD.
- Complete blood count (CBC):
  - All patients should have a CBC to identify [2,3] [**L2**]:
    - Anaemia.
    - Polycythaemia.
    - Leucocytosis.
- BMI should be calculated on initial diagnostic evaluation[3] [**L2, RGA**]:.
- Some biomarkers can be used to direct treatment in case of exacerbation, such as [2] **[L2, RGB]**:
  - C-reactive protein (CRP) for antibiotic usage.
  - Procalcitonin for antibiotic usage.
  - Eosinophils count to guide corticosteroids usage.

8.2 Additional Investigations

Consider performing the following additional investigations if indicated.

Sputum Culture:

- Performed to identify organisms if sputum is persistently present and purulent[3] [**L2**].

Arterial Blood Gas:

- Consider performing an arterial blood gas analysis (ABG) [2,3] :
  - If oxygen saturation (SpO_2) is ≤ 94% on air, when the patient is stable, to stage the severity of COPD.
  - If the patient's condition is unstable.

Spirometric Reversibility Testing [3,19]:

- Is not routinely required for diagnosis or in planning initial bronchodilator or corticosteroid treatment.
- If differentiation of asthma from COPD is required, perform spirometric reversibility testing.
- Should be performed when the patient is clinically stable and free from respiratory tract infection.
- Patient should not have taken:
  - Inhaled short-acting bronchodilators in the previous 6 hours.
  - Long-acting bronchodilators in the previous 12 hours.
  - Sustained release theophylline in the previous 24 hours.
- Where diagnostic doubt remains, or both COPD and asthma are present, the following findings should be used to help identify asthma:
  - A ≥ 12% (or 200 mL) response in FEV_1 to bronchodilators.
- NB: Oral corticosteroid reversibility tests do not predict response to ICS therapy. The tests should not be used to select patients for ICS therapy [3] [**L1, RGA**].

CT Thorax:

- CT Thorax may be used to assess the following[3] [**L2**]:
  - To investigate:
    - Symptoms that seem disproportionate to the spirometric impairment.
    - Abnormalities seen on a chest radiograph.
  - Suitability for surgery.

Transfer Factor for Carbon Monoxide (T_LCO)[3]:

- T_LCO is performed to investigate symptoms that seem disproportionate to impairment at spirometry.
- T_LCO can help to differentiate between asthma and COPD

ECG and Echocardiogram:

- Performed to assess cardiac status if features of core pulmonale or features of cardiac disease are present [3] .

Diagnostic Sleep Evaluation:

- A diagnostic sleep evaluation is suggested for patients with COPD and signs and symptoms of a sleep disorder [4] [**L2, RGA**].

Alpha$_1$-Antitrypsin Levels [1,3,4] :

- Should be tested in patients with early onset COPD, minimal smoking history, or a family history of early onset COPD.
- Relatives of patients identified as having alpha$_1$-antitrypsin deficiency should be offered an assessment.

View Pathway

9 Diagnosis

9.1 Diagnosis of COPD

The number of premature deaths from COPD can be reduced through early accurate diagnosis and appropriate treatment[1]. Late diagnosis has a strong association with hospital admissions for exacerbations[1].

There is no single diagnostic test for COPD[3]:

- Diagnosis depends on clinical judgement based on a combination of[3]:
  - Signs and symptoms.
  - Confirmation of the presence of airway obstruction using spirometry.
- The Global Initiative for Chronic Obstructive Lung Disease (GOLD) recommend considering a diagnosis of COPD in patients aged 40 years and older who present with the following[2,19]:
  - Dyspnoea that is:
    - Progressive.
    - Worse with exercise.
    - Persistent.
  - A chronic cough – may be intermittent and unproductive.
  - Chronic sputum production.
  - History of exposure to risk factors, particularly smoking.

Consider ACOS if [2] [**L2**]:

- Airflow limitation is persistent along with several features associated with asthma and other features associated with COPD.

9.2 Assessment of COPD Severity

No single measure can give an adequate assessment of the true COPD severity in an individual [3] . Severity assessment has implications for therapy and relates to prognosis [3] .

9.2.1 Severity Assessment

Severity assessment should be based on the following [3] :

- Degree of airway obstruction.
- Degree of disability.
- Frequency of exacerbations.
- The following prognostic factors:
  - FEV_1.
  - T_LCO.
  - Breathlessness – Medical Research Council (MRC) scale (see below).
  - Health status.
  - Exercise capacity, e.g. 6-minute walking test.
  - BMI.
  - PaO_2.
  - Cor pulmonale.

9.2.2 Medical Research Council Dyspnoea Scale

The MRC dyspnoea scale is used to grade breathlessness as follows [3] :

Grade	Definition
Grade 1	Breathlessness only occurs during strenuous exercise.
Grade 2	Breathlessness occurs when walking up a slight incline or hurrying on level ground.
Grade 3	Breathlessness prevents walking at the same speed as contemporaries on level ground, or at their own pace.
Grade 4	Breathlessness occurs when walking on level ground or after around 100 m.
Grade 5	Breathlessness prevents leaving the house or hinders day-to-day functioning.

Table 9.2.2: The MRC Dyspnoea scale [3] .

9.2.3 GOLD Classification

The GOLD stages classify the severity of airflow limitation according to the reduction in post-bronchodilator FEV_1 as a percentage of the predicted value [2,3,19] :

In patients with $FEV_1/FVC < 0.7$ [2,19] :

Stage	Definition
Stage 1 (Mild)	$FEV_1 \geq 80\%$ predicted
Stage 2 (Moderate)	$FEV_1 \geq 50\%$ and $< 80\%$ predicted
Stage 3 (Severe)	$FEV_1 \geq 30\%$ and $< 50\%$ predicted
Stage 4 (Very Severe)	$FEV_1 < 30\%$ predicted; or $FEV_1 < 50\%$ predicted plus chronic respiratory failure

Table 9.2.3: GOLD Classification [2,19].

9.3 Differential Diagnosis of COPD

The differential diagnosis of COPD includes the following [2,3,17] :

- Asthma.
- ACOS.
- Congestive cardiac failure.
- Bronchiectasis.
- Carcinoma of the bronchus.
- Interstitial lung disease.
- Recurrent pulmonary embolism.
- Tuberculosis (TB).
- Obliterative bronchiolitis.
- Diffuse panbronchiolitis.
- Bronchopulmonary dysplasia.

View Pathway

10 Referral to Specialist Care

Consider referral to a specialist, for any of the following [3,20] :

- To confirm diagnosis of COPD and optimise therapy if:
    - There is diagnostic uncertainty.
        - Symptoms disproportionate to lung function.
        - Unusual symptoms, e.g. haemoptysis.
    - The patient requests a second opinion.
    - There is onset of cor pulmonale.
- Assessment for [3] [**L2**]:
    - Oxygen therapy.
    - Long-term nebuliser therapy.
    - Oral corticosteroid therapy.
    - Pulmonary rehabilitation.
    - Lung volume reduction surgery
    - Lung transplant.
- Bullous lung disease.
- Rapid decline in FEV_1.
- Dysfunctional breathing.
- Patients younger than age 40 years or with a family history of $alpha_1$-antitrypsin deficiency.
- Patients with frequent exacerbations.

Patients who are referred do not always have to be assessed by a respiratory physician − A COPD team member with appropriate training and expertise can see patients [3] [**L2**].

View Pathway

11 Management of Stable COPD

11.1 Multidisciplinary Team Management

The management of COPD should be delivered by a multidisciplinary service, including the following[3] [**L3, RGA**].

- Doctors.
- Nurses, including a respiratory nurse specialist.
- Physiotherapists.
- Occupational therapists.
- Pharmacists.

In severe cases of COPD, the service should also include the following [3] :

- Dietitian.
- Social worker.
- Mental health trained worker.
- Clinical psychologist or liaison psychiatrist.

Functions of the service include [3] :

- Assessing the:
    - Need for oxygen therapy on an ongoing basis.
    - Need for aids for daily living.
    - Need for nutritional supplementation.

- Care and treatment of patients, including:
    - Prescribing appropriate medication.
    - Non-invasive ventilation (NIV).
    - Pulmonary rehabilitation.
    - Early discharge schemes.
    - Providing palliative care.
    - Identifying and managing anxiety and depression.
- Identifying patients at risk of exacerbation.
- Providing care to prevent emergency admissions.
- Educating patients and other healthcare professionals.

When managing a patient with COPD, consider all of the following [3] :

- Health and preventative measures.
- Pharmacological treatment.
- Pulmonary rehabilitation.
- Oxygen therapy.
- Surgery.
- Palliative care.

11.2 Health and Preventative Measures

Advice on health promotion and education includes [3] :

- Encourage smoking cessation.
- Vaccination.
- Exercise advice.
- Travel and leisure advice.

11.2.1 Smoking Cessation

Smoking is the main preventable cause of COPD [1,13,19] . All patients with COPD should be encouraged to stop smoking [1,2,4,13,19] [**L1, RGA**], and help to stop should be offered at every opportunity [3] [**L1**]. Referral to a smoking cessation service should also be considered [21] . Although smoking cessation cannot restore lung function that has been lost through smoking, it can prevent accelerated decline [3] .

Note that e-cigarettes or vaping are associated with similar risks to smoking and cannot be considered as methods to reduce the effect of smoking [2].

11.2.2 Vaccination

The MOPH Public Health Department recommends the following immunisations in patients with COPD, unless contraindicated [22] :

- Annual influenza vaccine, ideally before influenza viruses circulate each year.
- Pneumococcal vaccination:
    - Administer pneumococcal conjugate vaccine (PCV13) if not previously given during the patient's lifetime.
    - Administer pneumococcal polysaccharide vaccine (PPSV23) 6-12 months after vaccination with PCV13.
    - Repeat PPSV23 to a maximum of 3 times during the patient's life with the final dose given after the age of 65 years.

11.2.3 Exercise Advice

Patients should be reminded that exercise is not dangerous [2,5,13] . Advise patients to [2,5,13] :

- Follow a general exercise programme at an intensity suitable to the patient's condition and comorbidities.
- Take regular exercise that leaves them a little short of breath – if possible, 30 minutes a day, 5 times a week [5] [**L2**].
- Gradually increase their level of exercise.
- Do upper limb activities, e.g. twisting and arm stretches [2] [**L2, RGA**].

11.2.4 Travel and Leisure Advice

Air Travel [1–3,13] :

- If air travel is considered, all patients with COPD should contact their primary healthcare professional for a fitness-to-fly assessment.
- Patients with bullous lung disease are at high risk of pneumothorax.
- All patients on long-term oxygen therapy (LTOT), or who have severe COPD (FEV_1 < 30% predicted), should consult their respiratory specialist before flying.
    - Patients with a PaO_2 of ≥9.3 kPa (70 mmHg) are likely to be safe to fly without supplementary oxygen.
    - Commercial air travel is contraindicated if a patient requires oxygen at > 4 L/min at sea level. Suitability can be assessed by initial measurement of:
        - History and examination.
        - Pulse oximetry.
        - Results of spirometry.
    - Depending on the results of the initial assessment, a hypoxic challenge test may be required to patients in whom in-flight oxygen is needed.

Scuba Diving [3] :

- Is not recommended for patients with COPD.
- Patients should seek specialist advice if they have queries.

11.3 Pharmacological Management

11.3.1 Pharmacological Management Considerations

Pharmacological management considerations [7,9] :

- As there are a large number of inhaled medicines indicated for the treatment of COPD, it is important to ensure that medicine classes are not duplicated whenever changes are made to the patient's treatment regimen.
- Medicines should be introduced in a stepwise fashion until adequate control of breathlessness, functional capacity, and exacerbation frequency is achieved.

11.3.2 Short-Acting Bronchodilators

Initial treatment [3] :

- Use a short-acting bronchodilator using the most appropriate device (e.g. inhaler, spacer, or nebuliser) as needed for the relief of symptoms, e.g. [3] [**L1, RGA**]:
    - Short-acting beta2-agonist (SABA), i.e. salbutamol or terbutaline; or
    - Short-acting muscarinic antagonist (SAMA), i.e. ipratropium bromide.

11.3.3 Long-Acting Bronchodilators

Long-acting bronchodilators should be offered to patients with confirmed, stable COPD who continue to have respiratory symptoms [4] [**L1, RGA**].

Regular treatment with long-acting bronchodilators is more effective and convenient than regular short-acting bronchodilators in patients with persistent symptoms or exacerbations despite use of short acting bronchodilators as required [2,3] .

Offer one of the following [3] [**L1, RGA**]:

- Long-acting beta2-agonist (LABA) alone; or
- Long-acting muscarinic antagonist (LAMA) alone; or
- Both a LABA and a LAMA in a combination inhaler.

Continue short-acting bronchodilator as required, in addition to the above if needed [3] .

11.3.4 Long Acting Bronchodilators with Inhaled Corticosteroids

If patient remains breathless or has one severe or two moderate exacerbations within 1 year, consider [3]:

- LAMA plus LABA; with an ICS.
- LAMA and LABA plus an ICS in a combination inhaler [3] [**L1, RGA**].
- Consider referral to a pulmonologist for specialist advice if triple therapy is being considered [**R-GDG**].
- Before initiating triple therapy, ensure that the presenting symptoms are caused by COPD and not any other physical or mental health condition [3].

- Triple therapy can be used for 3 months, after this period and evaluation is recommended. If the symptoms have improved, treatment should be continued, if not it is recommended to revert back to LAMA plus LABA [3].

11.3.5 Theophylline

Consider theophylline in patients who have already tried long-acting bronchodilators but who are unable to use inhaled therapy [3] [**L2, RGA**].

Theophylline [3] :

- Can be used in combination with a beta2-agonist or muscarinic antagonist.
- Addition of a low dose to ICS does not reduce the number of exacerbations [2] **[L2, RGC]**.
- Use with caution in elderly patients [3] [**L3, RGA**].
- Plasma levels must be monitored to ensure they do not reach the toxic range.
- Only offer theophylline after consultation with a pulmonologist.

11.3.6 Phosphodiesterase-4 Inhibitor

Phosphodiesterase-4 inhibitor [2,4] :

- Oral medication taken once daily.
- Reduces inflammation by inhibiting breakdown of intracellular cyclic-AMP.
- Consider in addition to triple inhaler therapy, in cases where chronic bronchitis is the predominant feature with a history of exacerbations.
- Has more adverse effects than inhaled medications; however, they do diminish over time with continued treatment [2] [**L1**].
- Only offer a phosphodiesterase-4 inhibitor after consultation with a pulmonologist [**R-GDG**].

11.3.7 Mucolytics

Mucolytics:

- Consider in patients with chronic productive cough and continue if there is symptomatic improvement [3] [**L1, RGA**].
- A few patients with viscous sputum may benefit but overall benefits appear to be small [2] .
- Do not routinely use to prevent exacerbations [3] [**L2**].

11.3.8 Oral Corticosteroid Therapy

Maintenance use of oral corticosteroid therapy is not normally recommended [3] :

- However, patients with advanced COPD may require long-term oral corticosteroid treatment when they cannot be withdrawn following an exacerbation.
- Refer to a pulmonologist if long-term corticosteroid treatment is being considered.

11.3.9 Other Pharmacological Treatment Options

Other treatments:

- Vitamin D is recommended to reduce exacerbations for patients with low vitamin D levels [2] **[L2, RGA]**.
- Anti-IL-5 monoclonal antibody (mepolizumab) and anti-IL-5 receptor-α antibody (benralizumab) in severe COPD for patients with recurrent exacerbations and elevated eosinophils count [2] **[L2, RGA]**.

View Pathway

11.4 Pulmonary Rehabilitation

Pulmonary rehabilitation should be offered to patients with COPD[4] [**L1, RGA**], including those who have had a recent hospitalisation for an acute exacerbation[3] [**L1, RGA**] and those who have self-reported exercise limitation[5] [**L2**].

Pulmonary rehabilitation [2,3] :

- Is a multidisciplinary programme of care.
- Should be [3] [**L1, RGA**]:
    - A supervised program Individually tailored to optimize the patient's physical and social performance and autonomy.
    - Performed at least twice weekly.
    - Offered to all patients with an MRC dyspnea score of Grade 3 or above.

Pulmonary rehabilitation is not suitable for [5] [**L2**]:

- Patients who have difficulty walking, e.g. severe arthritis or severe peripheral vascular disease.
- Patients with unstable cardiac disease.

Benefits include [3,23] :

- Improvement in:
    - Exercise capacity.
    - Health-related quality of life.
    - Strength and endurance of upper limbs.
    - Functional capacity, e.g. activities of daily living.
    - Survival.

Although supervised hospital-based pulmonary rehabilitation is the standard method, home-base and community-based programs can also be applied [2] **[L2, RGA]**.

11.5 Oxygen Therapy

11.5.1 Long-Term Oxygen Therapy

Long-term oxygen therapy (LTOT) [2,3,6–8] :

- Is defined as oxygen used for at least 15 hours per day in chronically hypoxaemic patients.
- Should be prescribed after appropriate assessment.
- Is indicated in:
    - Patients with $PaO_2 \leq 7.3$ kPa (55 mmHg) when stable; or
    - $PaO_2 \leq 8$ kPa (60 mmHg) when stable, plus one of the following [2,3,8] [**L1**]:
        - Secondary polycythaemia – haematocrit ≥ 55%.
        - Nocturnal hypoxaemia.
        - Peripheral oedema.
        - Pulmonary hypertension.
- Oxygen flow rate [3,8] :
    - Initiated at 1 L/min; titrated up by 1 L/min until an SpO_2 of 88-92% is achieved.
    - ABG should then be performed to confirm target PaO_2 and CO_2 levels.
    - There is no benefit for patients with chronic hypoxaemia to achieve a $PaO_2 > 8$ kPa (60 mmHg).
- Patients should breathe supplemental oxygen for at least 15 hours per day, including at night [2,3,8] [**L1, RGA**].

- Warn patient about the dangers if they continue to smoke with prescribed oxygen.
- For patients to be eligible for LTOT, it is a requirement that their home be smoke-free.
- Review LTOT at least annually.

11.5.2 Ambulatory Oxygen Therapy

Ambulatory oxygen therapy [2,3,8] :

- Should only be prescribed after assessment has been performed by a specialist.
- Consider in the following patients [2,3,8] [**L3, RGA**]:
    - Patients already on LTOT who are mobile outside the home.
    - Patients who have exercise desaturation.
    - Patients shown to have an improvement in exercise capacity and/or dyspnoea with oxygen.
        - Should only be offered for use during pulmonary rehabilitation or an exercise programme after formal assessment shows improved exercise endurance [8] [**L1, RGA**].

11.5.3 Long-Term Non-Invasive Ventilation

The following patients should be referred to a specialist centre for consideration for long-term NIV [3,8,9] :

- Patients with chronic hypercapnic respiratory failure who have required assisted ventilation (invasive or non-invasive) during an exacerbation.
- Patients who are hypercapnic ($PaCO_2$ > 6 kPa (45 mmHg)) or acidotic (blood pH < 7.35) whilst on LTOT.
- Patients with chest wall or neuromuscular disease causing hypercapnic respiratory failure:
    - Additional LTOT may be required in case of hypoxaemia not corrected with NIV.

NB: NIV should be started in a controlled environment 2-3 days prior to discharge [**R-GDG**].

11.5.4 High-Flow Nasal Therapy

High-low nasal therapy (HFNT) is the use of heated and humidified oxygen, combined with a blend of other gas, using specific devices, via the nasal cavity [2] **[L2, RGA]**:

- Used for patients with hypoxemic respiratory failure.
- Rate: up to 60 L/min for adults.
- Improves oxygenation and ventilation.
- Decreases hypercarbia.

11.6 Surgery

Any patient who is considered for surgery should first be referred to a pulmonologist for evaluation [4] [**L2**]**.**

Bullectomy [3] :

- Indicated for relief of dyspnoea or to manage complications of bullae.
- Usually involves removal of a single large bulla that leads to collapse of surrounding tissue.
- Considered in patients with isolated bullous disease on CT and an FEV_1 of < 50% predicted [3] [**L2**].

Lung Volume Reduction[3] :

- Aims to reduce breathlessness by removing areas of poorly functioning lung, but it does not appear to have any effect on long-term survival.
- Improves walking distance and quality of life.
- Is an alternative to lung transplantation in selected patients.
- Consider for patients with severe COPD who, despite maximal medical therapy, remain breathless and restricted in activities of daily living – should meet the following criteria [3] :
    - FEV_1 > 20% predicted.
    - $PaCO_2$ < 7.3 kPa (54 mmHg).
    - Upper lobe predominant emphysema present.
    - T_LCO > 20% predicted.

Bronchoscopic Intervention[3]:

- Patients should be assessed by the specialist multidisciplinary team to determine suitability for bronchoscopic interventions, including:
    - Endobronchial valves.
    - Endobronchial coils.
        - Endobronchial coils should only be offered as part of a clinical trial following assessment of suitability for lung volume reduction[3].

Lung Transplantation [3] :

- May be considered in patients with severe COPD who, despite maximal medical therapy, remain breathless and restricted in activities of daily living.

11.7 Palliative Care

Palliative care is an important component in the management of all patients with end-stage COPD [2] .

Consider the following for the palliation of breathlessness in patients with end-stage COPD unresponsive to other medical therapies [3] :

- Opioids.
- Benzodiazepines.
- Tricyclic antidepressants.
- Major tranquillisers.
- Oxygen.

Effective communication between patients and clinicians should be ensured [2] :

- To give patients the opportunity to make informed decisions about their care; and
- To ensure clinicians understand the patient's values, goals, and perspectives.

View Pathway

12 Management of Acute Exacerbations of COPD in Primary Care

12.1 Acute Exacerbation Definition

Exacerbations of COPD:

- Are defined as [2,3,20] :
    - The sustained worsening of the patient's symptoms from their usual stable state which is beyond normal day-to-day variations; and
- Are acute in onset.
- Require a change in regular medication.

12.2 Causes of Acute Exacerbations

The following can cause exacerbations of COPD, although the cause is unidentifiable in 30% of cases [2,3] :

- Infections of the tracheobronchial tree [3] :
    - Viral:
        - Rhinoviruses (common cold).
        - Influenza.
        - Parainfluenza.
        - Coronavirus.
        - Respiratory syncytial virus.
    - Bacterial:
        - Haemophilus influenzae.
        - Streptococcus pneumoniae.
        - Moraxella catarrhalis.
        - Staphylococcus aureus.
        - Pseudomonas aeruginosa.
        - Chlamydophila pneumoniae.
- Common pollutants.
- Seasonal changes.

12.3 Clinical Presentation and Diagnosis of Acute Exacerbations

Presenting features of acute exacerbations of COPD [2,3] :

- Worsening breathlessness.
- Increased cough and wheeze.
- Increased sputum production.
- Increased sputum purulence.
- Upper airway symptoms.
- Chest tightness.
- Reduced exercise tolerance.
- Oedema.
- Acute confusion.
- Chest pain.
- Fever.

The diagnosis of an exacerbation is made clinically [3] :

- It does not depend on the results of investigations, but investigations may at times assist in ensuring appropriate treatment is given.

View Pathway

12.4 Differential Diagnosis of an Acute Exacerbation

Consider the following differential diagnoses for an exacerbation [2,3] :

- Pneumonia.
- Pneumothorax.
- Left ventricular failure/pulmonary oedema.
- Pulmonary embolism.
- Upper airway obstruction.
- Pleural effusion.
- Lung cancer.
- Recurrent aspiration.
- Cardiac arrhythmias.

12.5 Assessing the Severity of an Exacerbation

Assess the severity of the exacerbation [2,13] :

- By measuring the following:
  - Blood pressure.
  - Respiratory rate.
  - SpO_2.
- Based on the patient's medical history before the exacerbation:
  - Severity of COPD based on the degree of airflow limitation.
  - Number of previous exacerbations/hospitalisations.
  - Comorbidities.
  - Duration of worsening or new symptoms.
  - Current treatment regimen.
  - Previous use of mechanical ventilation.

Signs of a severe exacerbation include [2,3] :

- Marked dyspnoea.
- Tachypnoea.
- Pursed lip breathing.
- Use of accessory respiratory muscles.
- Paradoxical chest wall movements.
- Worsening or new onset central cyanosis.
- Haemodynamic instability.
- New onset peripheral oedema.
- Deteriorated mental status.
- Acute confusion.
- Marked reduction in activities of daily living.

Assess the need for hospital admission based on clinical findings and social circumstances [2] .

12.6 Initial Management of Acute Exacerbation in Primary Care

Prompt therapy for exacerbations results in [2,3] :

- Less lung damage.
- Faster recovery.
- Fewer admissions and subsequent readmissions.

Management:

- Increase frequency of bronchodilator [3] :
    - Nebulisers and hand-held inhalers can be used to administer inhaled therapy during exacerbations [3] [**L1**].
        - Air-driven bronchodilator nebulization is recommended if a nebuliser is needed to deliver the bronchodilator since oxygen-driven nebulisation can increase the $PaCO_2$ levels [2] **[L2, RGA]**.
    - Choice of delivery should reflect [3] [**L3, RGA**]:
        - Dose of medication required.
        - The ability of the patient to use the device.
    - If patient is not taking a short-acting bronchodilator, prescribe an inhaler to use as required or on a regular basis.
    - If the patient is already taking a short-acting bronchodilator as required, adjust therapy to control their symptoms.

- Consider starting treatment with oral corticosteroids [3] [**L1, RGA**]:
    - Prednisolone 30-40 mg daily for 5 days for patients with severe exacerbation of COPD and increased breathlessness, if not contraindicated [3] [**L2**].
    - Long courses of oral corticosteroids should be avoided as they are associated with an increased risk of pneumonia and mortality [2] **[L2, RGC].**
    - Corticosteroids are less efficient in patients with low eosinophil count [2] **[L2].**

- Start oral antibiotics [2,4,10] [**L1, RGA**]:
    - If the patient has:
        - Purulent sputum and:
            - Increased breathlessness; and/or
            - Increased sputum volume.

Empirical antibiotic regime [4,10] :

- Amoxicillin or doxycycline for 5 days.
    - If patient is allergic to penicillin or doxycycline is contraindicated, use:
        - Clarithromycin for 5 days.
    - If patient has antibiotic resistance, use:
        - Co-amoxiclav for 5 days.

12.7 Oxygen Therapy

Oxygen therapy during an acute exacerbation [24] :

- Commence treatment using a 28% Venturi mask at 4 L/min in pre-hospital care and aim to maintain SpO_2 at 88–92%.
- Refer the patient promptly to the Emergency Department for assessment.

12.8 Monitoring Following Exacerbation

Patients' recovery should be monitored by regular clinical assessment of their symptoms and their functional capacity, in order to [3,13] [**L2**]:

- Optimise current treatment.
- Assess whether a change in medication is appropriate.
- Consider referral to pulmonary rehabilitation.
- Discuss vaccinations.

- Review inhaler technique and compliance with medication.
- Review smoking cessation and consider referral to the smoking cessation clinic.
- Review the patient's self-management plan.
- Provide information on recognising exacerbations and early intervention.

12.9 Prevention of Exacerbation

Provide self-management advice for selected patients who are compliant with instructions and advice[2,3,25]:

- Encourage an early corticosteroid response to symptoms of exacerbation, unless contraindicated.
- Start antibiotic therapy if sputum becomes [2,3] [**L1, RGA**]:
    - Purulent with either:
        - Increased sputum volume**;** or
        - Increased breathlessness.
- Adjust bronchodilator therapy to control symptoms.
- For patients with moderate to severe COPD and a history of ≥ 2 exacerbations in the previous 2 years, treat with oral N-acetylcysteine to prevent acute exacerbations [25] [**L1, RGA**].
- Advise patients to contact a healthcare professional if symptoms do not improve [3] [**L2**].

View Pathway

13 Management of Acute Exacerbation of COPD in Specialist Care

13.1 Indications for Hospital Admission

The following factors favour treatment in hospital [2,3,20] :

- Marked increase in symptom intensity and/or rapid deterioration.
- Respiratory rate ≥ 24 breaths per minute.
- SpO_2 ≤ 92% in air.
- New onset physical signs, e.g. cyanosis, peripheral oedema.
- Current need for NIV.
- Worsening physical function.
- Older age.
- Significant co-morbidities present.
- History of frequent exacerbations.
- Previous exacerbation, which required intensive care unit (ICU) admission.
- Failed response to initial medical treatment of exacerbation.
- Inability to manage the patient at home.
- Uncertainty of diagnosis.

13.2 Investigation

For all patients referred to hospital, perform or measure the following [2,3] :

- Chest radiograph.
- ABG − record inspired oxygen concentration [3] [**L2**].
- ECG.
- CBC.
- Urea and electrolytes.
- Sputum microscopy and culture if purulent.
- Blood cultures − recommended if pyrexial or pneumonia is suspected.

13.3 Oxygen Therapy

Administration of oxygen therapy [24] :

- Administer controlled oxygen therapy and titrate to maintain SpO_2 at 88-92%.
- Reassess the patient at intervals with monitoring of arterial blood gases.
- Consider ventilation if:
    - The patient develops respiratory acidosis or is at risk of decompensation.
    - The patient is not improving satisfactorily.

13.4 Bronchodilators

Bronchodilators:

- Administer salbutamol by air-driven nebuliser [2] .
- Severe exacerbations [2] :
    - Increase the frequency and/or dose of salbutamol use [3] .
    - Combine salbutamol with ipratropium bromide [2] .

View Pathway

13.5 Corticosteroid Therapy

Corticosteroid therapy [2,3] :

- Consider IV or oral corticosteroids in conjunction with other therapies for all patients admitted to hospital with an exacerbation if no contraindications are present.
- Prescribe oral prednisolone for 7-14 days, when the patient is able to take medication orally:
    - Therapy is not recommended beyond 14 days, as there is no benefit of prolonged maintenance therapy[3] [**L1**].
    - Treatment can be stopped without tapering the dose.
    - In some cases, oral corticosteroids cannot be stopped due to the severity of disease. In such cases, the dose of oral corticosteroid should be kept as low as possible [**R-GDG**].

13.6 Antibiotic Treatment

Antibiotic treatment [2,4,10] [**L1, RGA**]:

- Consider antibiotics, oral, or IV if there are signs of bacterial infection.
- Use antibiotics if the patient has:
    - Purulent sputum; and
        - Increased breathlessness; and/or
        - Increased sputum volume.

Empirical treatment:

- Initial empirical treatment should be with one of the following, taking into account any guidance issued by the local microbiologist [2–4,10] [**L1, RGA**]:
    - Aminopenicillin, e.g. amoxicillin or co-amoxiclav, is usually the first-line choice.
    - Tetracycline, e.g. doxycycline.
    - Macrolide, e.g. clarithromycin.

13.7 Theophylline

Theophylline [3] [**L2**]:

- Consider use as an adjunct if there is inadequate response to nebulised bronchodilators.
- Trial short-acting and long-acting bronchodilators prior to using theophylline.
- Particular caution should be taken in the use of theophylline in older patients because of differences in pharmacokinetics, the increased likelihood of comorbidities, and the use of other medications [**R-GDG**].

13.8 Intermittent Positive Pressure Breathing (IPPB)

Intermittent positive pressure breathing (IPPB) [6] :

- Consider in patients experiencing acute exacerbations who are too tired or weak to clear secretions through effective coughing.
- May be considered in acute exacerbations when patients do not have immediate access to NIV and intubation is not an option [6] [**L3, RGA**].

View Pathway

13.9 Ventilatory Support

Prior to starting ventilatory support, care should be planned with the patient and their family/carer, covering and documenting the following [3,11] :

- Risks and benefits of ventilation.
- What to do if the patient's condition deteriorates.
- Agreement on ceilings of therapy.
- How potential failure of treatment will be managed, including whether intubation and mechanical ventilation are indicated.

13.9.1 Non-Invasive Ventilation

Non-Invasive Ventilation (NIV):

- Should be considered [2,4,11,12] :
    - For all patients with an acute exacerbation of COPD with respiratory acidosis (arterial pH ≤ 7.35 and/or $PaCO_2$ ≥ 6kPa (45 mmHg)).
    - Within the first 60 minutes of hospital arrival if respiratory acidosis persists despite treatment.
    - To support weaning from invasive mechanical ventilation and earlier extubation of patients with COPD [4] [**L1, RGA**].
- IPPB [6] :
    - Consider in patients experiencing acute exacerbations who are too tired or weak to clear secretions through effective coughing.
    - May be considered in acute exacerbations when patients do not have immediate access to NIV and intubation is not an option [6] [**L3, RGA**].

Exclusion criteria for NIV [2,11] :

- Life-threatening hypoxia.
- Haemodynamic instability.
- Severe co-morbidity.
- Confusion, agitation, or severe cognitive impairment.
- Facial burns, trauma, recent facial or upper airway surgery.
- Vomiting.
- Fixed upper airway obstruction.
- Inability to protect the airway.
- Copious respiratory secretion.
- Bowel obstruction present.
- Heart failure or pneumonia are present.
- Cardiac or respiratory arrest.
- Massive aspiration.

13.9.2 Mechanical (invasive) Ventilation

Mechanical ventilation [3] :

- Consider for patients who:
    - Do not respond adequately to NIV and require intubation and ventilation.
    - As the first-line management option for patients with multiple organ system impairment or reduced level of consciousness.

View Pathway

13.10 Planning for Discharge

Prior to discharge [2,3] [**L2**]:

- Spirometry should be performed to allow an accurate assessment of airway obstruction at the patient's normal functional state.
- Patients should be re-established on optimal maintenance bronchodilator therapy.
- If the patient has had an episode of respiratory failure, satisfactory oximetry or ABG results should be recorded.
- Arrangements for follow-up and home care should be made.
- Ensure patient meets the following criteria:
    - Inhaled $beta_2$-agonist therapy is required no more frequently than every 4 hours.
    - If patient was previously ambulatory, ensure they are able to walk across the room.
    - Patient is able to eat and sleep without frequent awakening by dyspnoea.
    - Patient has been stable for 12-24 hours, including stable ABGs.
    - Patient understands correct use of medication.

13.11 Follow-Up by a Respiratory Specialist

Follow-up should assess whether [2,3] :

- The patient requires pulmonary rehabilitation post-discharge.
- The patient is able to cope in their usual environment.
- There is a need for LTOT and/or home nebuliser for patients with very severe COPD.

Include the following [2,7] :

- Measurement of FEV_1.
- COPD Assessment Test (CAT) or modified Medical Research Council questionnaires.
- Re-assessment of inhaler technique.
- Consideration for pulmonary rehabilitation.
- Establishment of patient's understanding of recommended treatment regimen.
- Status of co-morbidities.
- A chest radiograph depending on clinical circumstances.

13.12 Follow-Up in Primary Care

Consider discharge from pulmonology clinics to primary care for the following patients [20] :

- Those with stable COPD in whom a diagnosis of COPD is firmly established.
- Those who request to be followed up in primary care following advice from their primary care physician and pulmonologist.

View Pathway

14 Asthma-COPD Overlap Syndrome

14.1 Diagnosis

Asthma-COPD Overlap Syndrome (ACOS) [2] :

- Is characterised by persistent airflow limitation with several features associated with asthma and other features associated with COPD.
- Can have worse outcomes than either asthma or COPD alone.

Diagnosis of ACOS [2] :

- Clinical history may include:
  - Symptoms of chronic or recurrent cough, sputum production, dyspnoea, or wheeze.
  - Frequent acute lower respiratory tract infections.
  - History of smoking.
  - Personal history of asthma and/or atopy.
  - Family history of asthma and/or atopy.
  - Exposure to environmental hazards, e.g. airborne pollutants.
- Physical examination may demonstrate:
  - Normal examination findings.
  - Evidence of hyperinflation and other features of chronic lung disease or respiratory insufficiency.
  - Abnormal auscultation (wheeze and/or crackles).
- Chest radiograph:
  - May be normal, particularly in early stages.
  - Abnormalities may include:
    - Hyperinflation.
    - Airway wall thickening.
    - Air trapping.
    - Hyperlucency.
    - Bullae – or other features of emphysema.

Spirometry [2] :

- Airflow limitation is evident which is not fully reversible.
- Often with current or historical variability.
- Post-bronchodilator FEV_1/FVC ratio of < 0.7 is usually present.
- $FEV_1 \geq 80\%$ of predicted is consistent with mild ACOS.
- $FEV_1 < 80\%$ of predicted, indicates more severe airflow limitation and is associated with an increased risk of future events (e.g. mortality and exacerbations).
- Post-bronchodilator increase in FEV_1 of $> 12\%$ and 200 mL from baseline indicates a suspected diagnosis of ACOS.
- Post-bronchodilator increase in FEV_1 of $> 12\%$ and 400mL from baseline is consistent with diagnosis of ACOS.

14.2 Treatment of ACOS

Initial treatment of ACOS is as follows [2] :

- If asthma symptoms predominate (or there is uncertainty of the diagnosis), treat as asthma until further investigations are completed:
  - ICS in low or moderate dose according to symptoms.
  - A LABA should be continued or added.

    - NB: Do not treat with a LABA without an ICS.
- If COPD symptoms predominate [2] [**L2**]:
    - Start symptomatic treatment with bronchodilators or combination treatment but not an ICS alone.

Treatment of ACOS should also include [2] [**L2**]:

- Smoking cessation.
- Pulmonary rehabilitation.
- Vaccinations.
- Treatment of comorbidities.

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 [26].

Number	Numerator	Denominator
CO01	Number of patients with COPD in whom the diagnosis has been confirmed by post bronchodilator spirometry within 12 months of diagnosis.	Total number of patients with COPD in whom the diagnosis has been confirmed.
CO02	Number of patients with COPD who have had influenza immunisation in the preceding 1st August to 31st March.	Total number of COPD patients.
CO03	Number of patients >35 years presenting with a risk factor and one or more symptoms of COPD who have post-bronchodilator spirometry.	Total number of patients >35 years presenting with a risk factor and one or more symptoms of COPD
CO04	Number of COPD patients prescribed an inhaler who have their inhaler technique assessed at the start of treatment.	Total number of COPD patients prescribed an inhaler.
CO05	Number of patients with stable COPD and a persistent resting stable oxygen saturation level of 92% or less who have their arterial blood gases measured to assess whether they need LTOT.	Total number of patients with stable COPD and a persistent resting stable oxygen saturation level of 92% or less.
CO06	Number of patients discharged from hospital after an acute exacerbation of COPD who start a pulmonary rehabilitation programme within 4 weeks of discharge.	Total number of patients discharged from hospital after an acute exacerbation of COPD.

Table 16.1: Performance measures [26].

17 References

1. An Outcomes Strategy for COPD and Asthma: NHS Companion Document. :106.
2. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease. 2020.
3. National Institute for Health and Care Excellence (NICE). Chronic obstructive pulmonary disease in over 16s: diagnosis and management. 2019.
4. Anderson B, Brown H, Bruhl E. Health care guideline diagnosis and management of chronic obstructive pulmonary disease (COPD). 2016.
5. Bolton CE, Bevan-Smith EF, Blakey JD, et al. British Thoracic Society guideline on pulmonary rehabilitation in adults. *Thorax*. 2013;68 Suppl 2:ii1-30. doi:10.1136/thoraxjnl-2013-203808
6. Bott J, Blumenthal S, Buxton M, et al. Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient. *Thorax*. 2009;64 Suppl 1:i1-51. doi:10.1136/thx.2008.110726
7. Kolbe J. The optimal management of patients with COPD - Part 2: Stepwise escalation of treatment. *Best Practice Journal*. 2015:18-28.
8. Hardinge M, Annandale J, Bourne S, et al. British Thoracic Society guidelines for home oxygen use in adults. *Thorax*. 2015;70 Suppl 1:i1-43. doi:10.1136/thoraxjnl-2015-206865
9. McKenzie DK, Frith PA. The COPDX Plan: Australian and New Zealand Guidelines for the management of Chronic Obstructive Pulmonary Disease 2019. *Med J Aust*. 2019;178(S6). doi:10.5694/j.1326-5377.2003.tb05213.x
10. Public Health England. Management of infection guidance for primary care: for consultation & local adaptation. 2015.
11. Roberts CM, Brown JL, Reinhardt AK, et al. Non-invasive ventilation in chronic obstructive pulmonary disease: management of acute type 2 respiratory failure. *Clin Med Lond Engl*. 2008;8(5):517-521. doi:10.7861/clinmedicine.8-5-517
12. National Institute for Health and Care Excellence (NICE). Chronic obstructive pulmonary disease in adults. (QS10). 2016.
13. Clinical Knowledge Summaries (CKS). Chronic Obstructive Pulmonary Disease (COPD). 2015.
14. Supreme Council of Health (SCH). Qatar Health Report 2013. 2015.
15. The top 10 causes of death. https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death. Accessed March 9, 2020.
16. National Institute for Health and Care Excellence (NICE). Suspected cancer: recognition and referral. 2017.
17. Bradley B, Branley HM, Egan JJ, et al. Interstitial lung disease guideline: the British Thoracic Society in collaboration with the Thoracic Society of Australia and New Zealand and the Irish Thoracic Society. *Thorax*. 2008;63 Suppl 5:v1-58. doi:10.1136/thx.2008.101691
18. National Institute for Health and Care Excellence (NICE). Stop smoking services. (NG92). 2018.
19. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Spirometry for health care providers. 2010.
20. British Thoracic Society Standards of Care Committee. BTS statement on criteria for specialist referral, admission, discharge and follow-up for adults with respiratory disease. *Thorax*. 2008;63 Suppl 1:i1-i16. doi:10.1136/thx.2007.087627
21. Miller J, Edwards LD, Agustí A, et al. Comorbidity, systemic inflammation and outcomes in the ECLIPSE cohort. *Respir Med*. 2013;107(9):1376-1384. doi:10.1016/j.rmed.2013.05.001
22. Ministry of Public Health (MOPH). National Immunization Guidelines for Vaccine Providers. 2016.
23. Davidson AC, Banham S, Elliott M, et al. BTS/ICS guideline for the ventilatory management of acute hypercapnic respiratory failure in adults. *Thorax*. 2016;71(Suppl 2):ii1-ii35. doi:10.1136/thoraxjnl-2015-208209
24. O'Driscoll BR, Howard LS, Davison AG, British Thoracic Society. BTS guideline for emergency oxygen use in adult patients. *Thorax*. 2008;63 Suppl 6:vi1-68. doi:10.1136/thx.2008.102947
25. Maltais F, Decramer M, Casaburi R, et al. An official American Thoracic Society/European Respiratory Society statement: update on limb muscle dysfunction in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2014;189(9):e15-62. doi:10.1164/rccm.201402-0373ST

26. Champagne F, Dhami S. WHO Recommendations and Implementation Plan to Optimize and Institutionalize the National Clinical Guidelines for Qatar Project. 2017.

Appendix: Detailed Description of the Literature Search

A systematic search for existing literature on COPD was performed in the period March 8th – March 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 COPD assessment and/or management was performed in the *PubMed* database and websites of relevant organisations and societies including the *British Thoracic Society*, the *Lung Foundation Australia* and the *Public Health England*. The present guideline is primarily based on *UK NICE*, and the *Global Initiative for Chronic Obstructive Pulmonary Disease (GOLD)* 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 "COPD" and specified with the following terms in combinations:

guideline, epidemiology, definition, prevalence, risk factors, presentation, examination, diagnosis, differential diagnosis, symptoms, investigation, classification, management, prevention, smoking, vaccine, exercise, travel, treatment, bronchodilator, triple therapy, mucolytics, corticosteroids, oxygen, rehabilitation, surgery, palliative care, exacerbation, acute, admission, antibiotic, theophylline, ventilation, referral, specialist, discharge, follow-up, asthma.

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

View Pathway

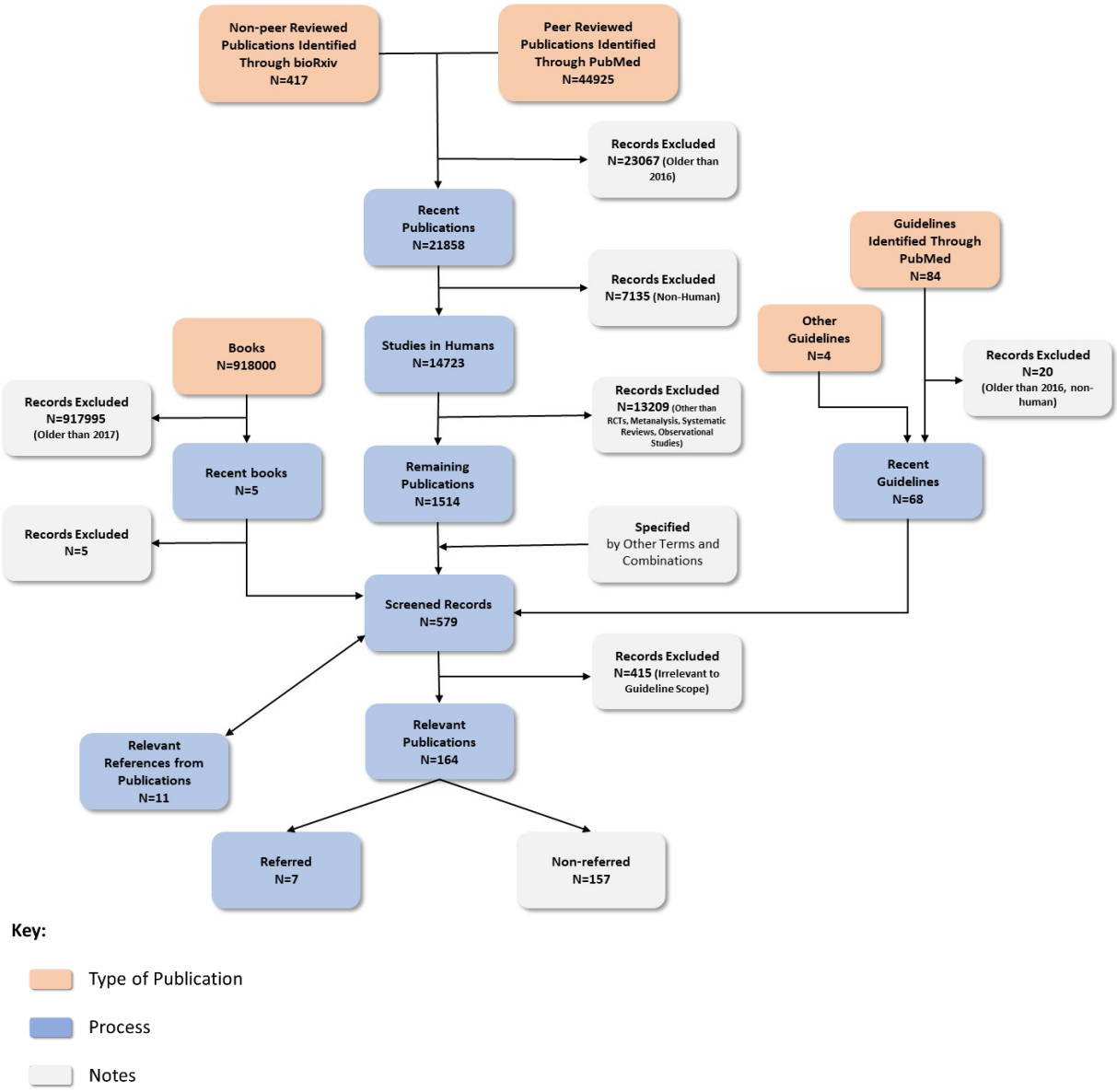


Fig A.1: Literature search results and application of exclusion criteria.

Acknowledgements

The following individuals are recognised for their contribution to the successful development of the National Clinical Guideline.

MOPH National Clinical Guidelines Team:

- **Ms Huda Amer Al-Katheeri**, *Director of Strategic Planning & Performance Dept, MOPH*.
- **Dr Nawal Al Tamimi,** *Head of Healthcare Quality & Patient Safety Dept, MOPH.*
- **Dr Rasha Bushra Nusr**, *Quality Improvement Senior Specialist, MOPH.*
- **Dr Rasmeh Ali Salameh Al Huneiti**, *Guideline & Standardisation Specialist, MOPH.*
- **Dr Bushra Saeed**, *Quality Improvement Coordinator, MOPH.*
- **Dr Mehmood Syed,** *Project Clinical Lead.*
- **Dr Samuel Abegunde,** *Physician Executive.*
- **Dr Natalia Siomava,** *Senior Medical Writer.*
- **Ms Rouba Hoteit,** *Medical Writer*

Please use the following email address to provide feedback on this guideline:
clinicalguidelines@moph.gov.qa