NATIONAL CLINICAL GUIDELINES

THE DIAGNOSIS & MANAGEMENT OF COMMUNITY ACQUIRED PNEUMONIA

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المبادئ الإرشادية السريرية لدولة قطر
NATIONAL CLINICAL GUIDELINES FOR QATAR

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

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Version History

Version	Status	Date	Editor	Description
1.0	Initial Version	14th December 2016	Guidelines Team	Published version.
2.0	Updated Version	28th July 2019	Guidelines Team	Updated Published Version.

Citation

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Abbreviations

The abbreviations used in this guideline are as follows:

AIDS	Acquired Immunodeficiency Syndrome
AMT	Abbreviated Mental Test
BP	Blood pressure
CAP	Community acquired pneumonia
CBC	Complete Blood Count
COPD	Chronic Obstructive Pulmonary Disease
CRP	C-reactive protein
CT	Computed Tomography
HIV	Human Immunodeficiency Virus
IV	Intravenous route
MERS- CoV	Middle East Respiratory Syndrome coronavirus
PCR	Polymerase Chain Reaction
PSI	Pneumonia Severity Index
RSV	Respiratory Syncytial Virus
TB	Tuberculosis
USC	Urgent Suspected Cancer form
PCV-13	Pneumococcal Conjugate Vaccine 13
PPSV-23	Pneumococcal Polysaccharide Vaccine 23

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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 community acquired pneumonia in individuals over 14 years of age. The objective is to reduce inappropriate prescribing and referral of patients presenting to any provider organisation in Qatar. It is intended that the guideline will be used primarily by physicians in both primary and secondary care settings.

1.2 Scope of the Guideline

This guideline covers the following aspects of care:

- Assessment and management of patients with community acquired pneumonia (CAP) in primary care as well as both secondary care outpatient and inpatient settings.
- CAP in individuals aged over 14 age and older.

Aspects of care not covered in this guideline are:

- Diagnosis and management of CAP in:
  - Children age 14 years and younger.
  - Immunocompromised patients.
  - Transplant patients.
- Management of patients with:
  - Lower respiratory tract infection other than pneumonia (e.g. pleurisy, bronchitis etc).
  - Hospital-acquired pneumonia.
  - Aspiration pneumonia.

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 Clinical Governance Group. The GDG members have reviewed and provided feedback on the draft guideline relating to the topic. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

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

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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 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
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Dr Egon Toft	VP and Dean of College of Medicine	College of Medicine, Qatar University

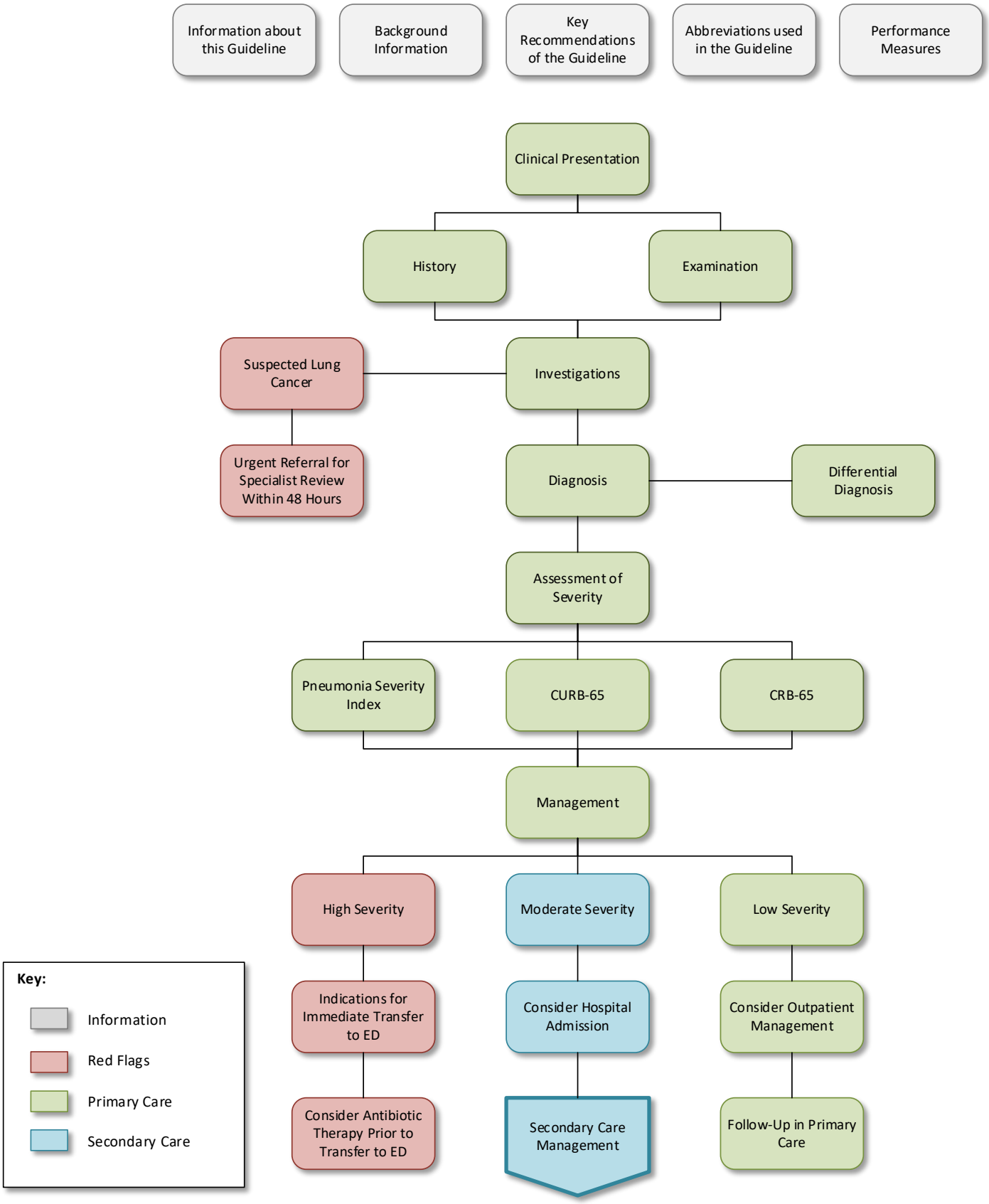
1.8 Responsibilities of Healthcare Professionals

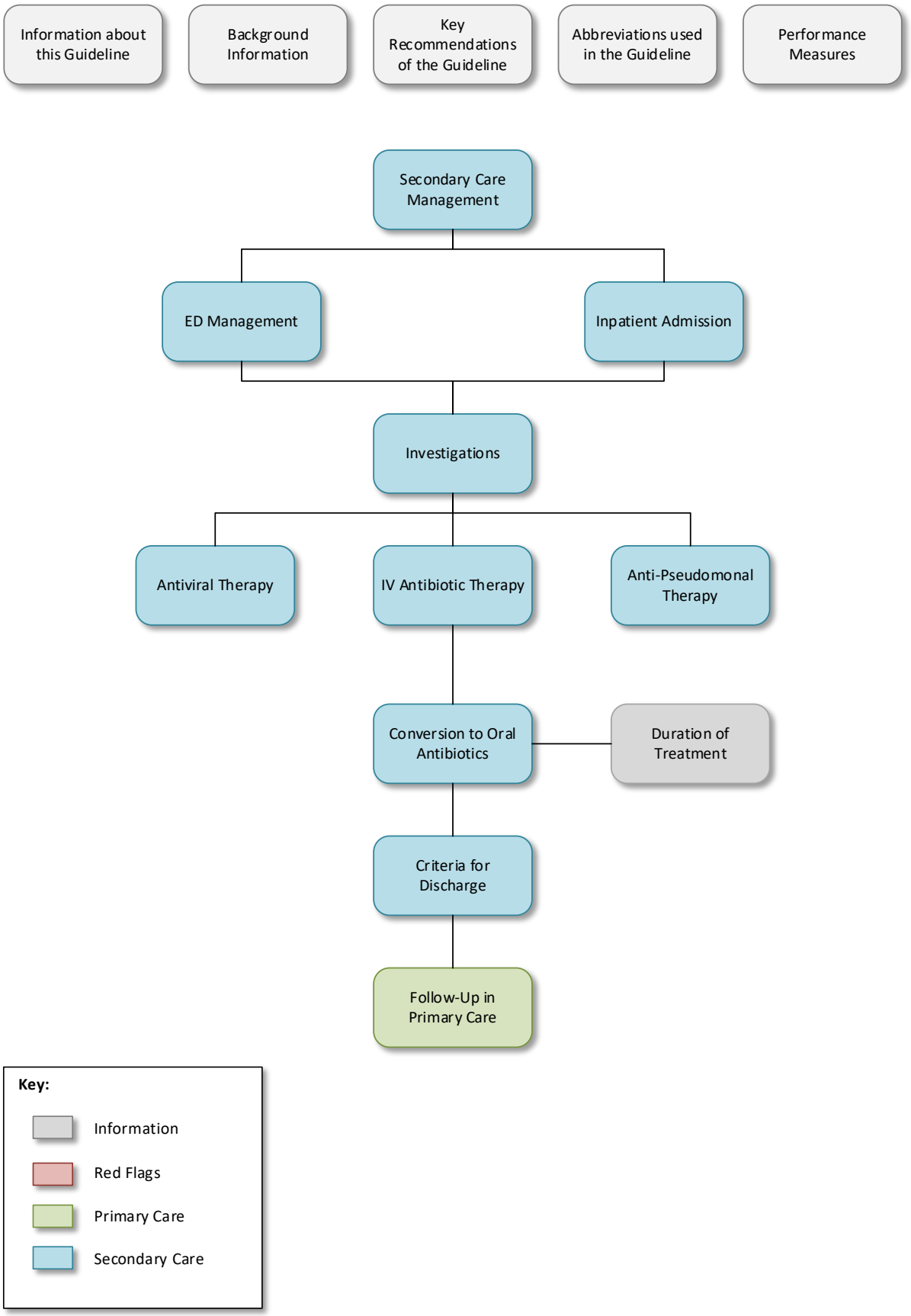
This guideline has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising 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 carers and should consider the individual risks and benefits of any intervention that is contemplated in the patient's care.

2 Community Acquired Pneumonia Pathway

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

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3 Key Recommendations of the Guideline

The key recommendations of this guideline are:

Suspected Lung Cancer (*Section 9.2.1*):

- Lung cancer may present with pneumonia and physicians should retain a high index of suspicion for the presence of malignancy and refer appropriately for investigation[1][**L2, RGA**].

Care Settings (*Section 10.1*):

- Patients at low risk of mortality can be managed safely in the community by experienced primary care physicians working within the bounds of their competence and ensuring adequate and regular review and safety-netting[2–6] [**L1, RGA**].
- Care in an observation setting (emergency department or short-stay ward) may be appropriate for short periods of time, to determine whether inpatient admission is truly warranted[2,3,5–7] [**L1, RGA**].
- The decision on appropriate venues for care, should be made on the basis of clinical judgement in conjunction with risk assessment using a validated risk scoring system (CRB-65, CURB-65 or PSI score)[2,3,5,7][**L1, RGA**].
- Inpatient admission should be reserved for those at higher risk of mortality or with a high risk of complications or poor social circumstances[2,3,5–7] [**L1, RGA**].
- When determining whether to refer or admit a patient to hospital, reference should be made to the specific admission criteria listed in *Section 10.3* [8–13] [**L1, RGA**].

Antimicrobial Treatment (*Section 10*):

- Antibiotic recommendations in this guideline (*Section 10*) are based upon available antibiogram data on the sensitivities and resistance of known pneumonia pathogens in Qatar[14] [**L3**].
- Recommended treatments should be adhered to where possible to minimise the emergence of drug-resistant bacteria in Qatar [**R-GDG**].

Discharge and Follow-Up (*Sections 10.3.9 & 10.3.10*):

- Patients should be followed up promptly by their primary care physician following an inpatient admission for community acquired pneumonia [**R-GDG**]
- An appropriately detailed discharge summary should be sent from secondary care to the patient's primary care physician [**R-GDG**].

4 Background Information

4.1 Definition

Community acquired pneumonia (CAP) is defined as an acute infection of the lung parenchyma acquired in the community[2]. Hospital-acquired pneumonia is defined as a pneumonia which develops 48 hours after hospital admission[3,6].

4.2 Infective Organisms

Streptococcus pneumoniae and *Mycoplasma pneumoniae* are regarded as the commonest pathogens causing community acquired pneumonia in Qatar **[R-GDG]**.

Other pathogens include[3,4,6,15]:

- *Haemophilus influenzae* and *Moraxella catarrhalis,* in patients with COPD.
- *Staphylococcus aureus* in patients with recent influenza infection.
- *Chlamydophylla psittaci* in patients exposed to birds.
- *Chlamydophylla pneumoniae*.
- *Legionella pneumophila*.
- Respiratory viruses including coronaviruses e.g. MERS-CoV.
- Other rare causes.

4.3 Prognosis

The key determinants of prognosis in the absence of treatment are the individual's particular immune response and the virulence of the infective organism. The level of antimicrobial resistance of the infective organism is also a key determinant of prognosis in patients undergoing treatment.

In instances of infection involving virulent strains of bacteria, or individuals with impaired immune responses – an untreated community acquired pneumonia may progress to the development of complications including respiratory failure, sepsis and multi-organ failure (see *Section 4.4*). Treatment therefore is aimed at providing antibiotics to patients according to the expected or proven sensitivities of the expected or proven pathogenic organism.

4.4 Complications

Possible complications of CAP include the following[3,4,6,15]:

- Sepsis.
- Arrhythmia.
- Multi-organ failure.
- Pleural effusion.
- Empyema.
- Lung abscess.
- Respiratory failure.
- Meningitis.
- Heart failure.
- Arthritis.

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4.5 Higher Risk Groups

Patients at higher risk of developing CAP include[3,4,6,15]:

- Patients aged 65 years and older.
- Smokers.
- Pregnant women.
- Patients with comorbidities including:
    - Chronic lung disease, e.g. chronic obstructive pulmonary disease (COPD).
    - Diabetes mellitus.
    - Cardiac or renal failure.
    - Immunosuppression (including post-splenectomy patients).
    - Recent infection with respiratory viruses, e.g. influenza.

As a preventative measure, people above the age of 65 or people with other co-morbidities such as heart disease, diabetes or COPD can be vaccinated to prevent having pneumonia that is caused by organisms covered by the vaccine. The immunization includes the use PCV-13 vaccine, followed by the PPSV-23 vaccine a year after[7,16–33].

5 Presentation

The typical presenting features of a patient with CAP are[3–6,34]:

- Cough.
- Sputum, which may be:
    - Increased in volume and purulence.
    - Rust-coloured, in *Strep. pneumoniae* infection.
    - Frank haemoptysis – can be attributed to pneumonia only after excluding other diseases e.g. tuberculosis (TB), lung cancer or pulmonary embolism.
- Dyspnoea.
- Wheeze:
    - More commonly associated with asthma, COPD, or bronchiectasis.
- Pleuritic chest pain.
- Systemic features, which may include:
    - Fever.
    - Sweats.
    - Myalgia.
- Extrapulmonary symptoms such as gastrointestinal symptoms.

Elderly patients with CAP more commonly present with fewer specific symptoms, are less likely to have a fever than younger patients and are more likely to have co-morbid disease and aspiration pneumonia[3,6].

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6 History

Important aspects of the patient history, include[5,34]:

- Symptoms and their duration.
- Age.
- Co-morbidity.
- Risk factors for unrecognised immunocompromised status, such as HIV/AIDS.
- Previous antibiotic use.
- Social history including smoking and alcohol history.
- Travel history.
- Contact with sick patients (e.g. TB cases).
- Contact with animals, especially birds and camels.
- History of recent viral URTI.

7 Examination

Signs indicative of CAP include[3–6]:

- Fever.
- Tachycardia.
- Tachypnoea or signs of respiratory distress.
- Hypotension.
- Reduced oxygen saturation - In the absence of chronic lung disease an oxygen saturation level (SpO_2) of less than 94%, is an adverse prognostic feature.
- Reduced consciousness level – especially in the elderly.
- Cyanosis.
- Dehydration.
- Focal chest signs (may be absent in the elderly):
    - Dullness to percussion.
    - Crepitations.
    - Wheeze.
    - Reduced air entry.

8 Investigations

8.1 Non-Inpatient Settings

In a primary, community, outpatient or emergency department setting, investigations *may* include the following but should be used according to the severity of the presentation and local availability of investigations[3,5,6,8–12,16,35–37][**L2, RGA1**]:

- Chest radiograph.
- CBC with differential.
- Pre-antibiotic blood cultures.
- Sputum Gram stain, culture.
- Chemistry including renal function and blood glucose.
- CRP (use for diagnosis and re-evaluate the diagnosis if CRP does not fall by more than 50% after two days of treatment).
- Procalcitonin.
- Urinary pneumococcal antigen test.
- Rapid influenza test.
- *Mycoplasma* PCR.

8.2 Inpatient Settings

In an inpatient setting, investigations will include all of the above. The following investigations may also be considered, according to the clinical presentation[3,5,6,8–12,16,35–37][**L2, RGA**]:

- Testing for MERS-CoV.
- Endotracheal tube, sputum or flocked nasopharyngeal swab for influenza.
- Endotracheal tube, sputum or flocked nasopharyngeal swab for respiratory viral PCR panel (includes the following: RSV, human meta-pneumo virus, parainfluenza virus 1-3, influenza A and B, adenovirus).
- Endotracheal tube, sputum or flocked nasopharyngeal swab for *Mycoplasma pneumoniae* PCR.
- Urinary antigen tests (e.g. for *Streptococcus pneumoniae* and *Legionella* bacteria).
- Arterial blood gases.
- Lactic acid levels.
- Vitamin D levels (low levels are associated with higher all-cause mortality among hospitalized CAP patients)[38–40]
- Other investigations that may be necessary to exclude other differential diagnoses or complications, according to the presentation, include:
    - Lung ventilation-perfusion scan.
    - Bronchoscopy.
    - Chest CT scan.
    - Echocardiogram.

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9 Diagnosis

9.1 Diagnosis of Community Acquired Pneumonia

CAP is diagnosed by the presence of the following[3,5,6,11]:

- Acute cough (less than 2 weeks) with at least one other lower respiratory tract symptom:
  - Sputum.
  - Wheeze.
  - Shortness of breath.
  - Pleuritic pain.
- New focal chest signs on examination.
- A temperature of 38°C (100.4°F) or higher (however normal temperature does not exclude pneumonia).
- There is no other explanation for the illness e.g. TB or post-obstructive pneumonia secondary to lung cancer.

NB: Consider risk factors for unrecognised immunocompromised status, and co-morbid conditions (refer to *Section 4.5*).

9.2 Differential Diagnosis

Ruling out other diagnoses is necessary before reaching a diagnosis of CAP[3,5,6].

Differential diagnoses include[1,3–6,11,41]:

- Underlying lung cancer (see *Section 9.2.1*), which often presents as a lower respiratory tract infection.
- TB.
- Pulmonary embolism or infarction.
- Cardiac failure - consider especially if fever is not present.
- Acute exacerbation of:
  - COPD.
  - Asthma.
  - Bronchiectasis.
- Influenza.
- MERS-CoV.
- Acute bronchitis.
- Post-infectious cough.
- Whooping cough.
- Post-nasal drip.

9.2.1 Suspected Lung Cancer

Cancer is an important differential diagnosis to be considered in patients suspected of community acquired pneumonia, especially in patients with a history of smoking[1][**L2**, **RGA**].

NB: If cancer is suspected, refer urgently, to be seen within 48 hours, using the Urgent Suspected Cancer (USC) referral form[42][**R-GDG**].

Features suggestive of cancer may include the following[1,42]:

- Recurrent or persistent chest infection.
- Finger clubbing.
- Supraclavicular lymphadenopathy or persistent cervical lymphadenopathy.
- Chest signs consistent with lung cancer.
- Thrombocytosis.
- Has chest radiograph findings suggestive of cancer; or
- Is aged 40 years and older with unexplained haemoptysis.
- Persistent pneumonia, despite appropriate treatment.
- History of smoking.

9.3 Assessment of Severity

Assess severity using the CRB-65, CURB-65 or Pneumonia Severity Index (PSI), in conjunction with clinical judgement[3,5–7][**L1, RGA**]. The choice of whether to use CRB-65 or CURB-65 is dependent on whether measurement of urea level is available within the facility in which the patient is being assessed[3,5–7].

9.3.1 CRB-65 Scoring System

The CRB-65 scoring system assesses the following clinical factors[3,5–7]:

- **C**onfusion:
  - An Abbreviated Mental Test (AMT) score of 8 or less; **or**
  - New disorientation in person, place, or time.
- **R**espiratory rate
  - ≥ 30 breaths per minute.
- **B**lood pressure:
  - Systolic BP ≤ 90mmHg; and/or
  - Diastolic BP ≤ 60mmHg
- **65** years and older.

Each clinical factor attracts a score of 1 point if criteria are met, to a maximum of 4. Patients are stratified for risk of death using both the scoring system and clinical judgement[3,5–7]:

- **Low risk:**
  - Indicated by a CRB-65 score of 0 or 1.
  - Treat the patient as an outpatient (see *Section 10.1*).

- **Intermediate risk:**
  - Indicated by a CRB-65 score of 2.
  - Refer to hospital for assessment (see *Section 10.2*).
  - Consider outpatient management, with close follow-up, in patients aged over 65 with no other CRB criteria (see *Section 10.1*).
- **High risk:**
  - Indicated by a CRB-65 score of 3 or more.
  - Refer for admission to an acute secondary care setting (see *Section 10.2*).

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NB: CRB-65 should not be used to replace clinical judgement when deciding if a person should be referred for hospital admission[3,5–7][**L1, RGA**].

Always take into account[3,5–7][**L1, RGA**]:

- Co-morbidities – pneumonia may result in a worsening of co-morbid illness that warrants hospital inpatient or critical care management, irrespective of the severity of pneumonia.
- Social circumstances – morbidity associated with CAP may negatively impact the extent that the patient is able to manage at home.
- General frailty.
- Pregnancy.
- Patient choice.

9.3.2 CURB-65 Scoring System

If measurement of blood urea nitrogen is available, then the CURB-65 scoring system should be used for assessment of severity of the illness, in conjunction with clinical judgement[3,5–7][**L1, RGA**].

The CURB-65 scoring system, assesses the following clinical factors[3,5–7]:

- **C**onfusion:
  - An Abbreviated Mental Test (AMT) score of 8 or less; **or**
  - New disorientation in person, place, or time.
- **U**rea:
  - Blood urea nitrogen level >7mmol/L or 19mg/dL.
- **R**espiratory rate
  - ≥ 30 breaths per minute.
- **B**lood pressure:
  - Systolic BP ≤ 90mmHg; and/or
  - Diastolic BP ≤ 60mmHg
- **65** years and older.

Each clinical factor attracts a score of 1 point, if criteria are met, to a maximum of 5. Patients are stratified for risk of death using both the scoring system and clinical judgement[3,5–7]:

- **Low risk:**
  - Indicated by a CURB-65 score of 0 or 1.
  - Treat the patient as an outpatient (see *Section 10.1*).
- **Intermediate risk:**
  - Indicated by a CURB-65 score of 2.
  - Refer to hospital for assessment (see *Section 10.2*).
  - Consider outpatient management, with close follow-up, in patients aged over 65 with no other CURB criteria (see *Section 10.1*).

- **High risk:**
  - Indicated by a CURB-65 score of 3 or more.
  - Refer for admission to an acute secondary care setting (see *Section 10.2*).

NB: CURB-65 should not be used to replace clinical judgement when deciding if a person should be admitted[3,5–7][**L1, RGA**].

Always take into account[3,5–7][**L1, RGA**]:

- Co-morbidities – pneumonia may result in a worsening of co-morbid illness that warrants hospital inpatient or critical care management, irrespective of the severity of pneumonia.
- Social circumstances – morbidity associated with CAP may negatively impact the extent that the patient is able to manage at home.
- General frailty.
- Pregnancy.
- Patient choice.

9.3.3 Pneumonia Severity Index

The Pneumonia Severity Index (PSI) is an alternative scoring system that can be applied in any patient to determine whether outpatient, or inpatient management should be followed[2].

Risk Factor	Points
Demographics	
Men	Age (years)
Women	Age (years) -10
Nursing home resident	+10
Comorbidities	
Neoplasm	+30
Liver disease	+20
Heart failure	+10
Stroke	+10
Renal failure	+10
Physical examination findings	
Altered mental status	+20
Respiratory rate ≥30 breaths per minute	+20
Systolic blood pressure < 90 mmHg	+20
Temperature <35°C (95°F) or ≥40°C (104°F)	+15
Pulse rate ≥125 beats per minute	+10
Laboratory and radiographic findings	
Arterial pH <7.35	+30
Blood urea nitrogen >30 mg/dL	+20
Sodium <30 mmol/L	+20
Glucose ≥250 mg/dL	+10
Haematocrit <30%	+10
Partial pressure of arterial oxygen (PaO_2) < 60 mmHg	+10
Pleural effusion	+10
Total	

Table 9.3.3(1): Pneumonia Severity Index[2].

Point Total	Risk Class	Recommendation
< 51	Class I	Consider outpatient therapy
51 to 70	Class II	Consider outpatient therapy
71 to 90	Class III	Consider hospitalisation
91 to 130	Class IV	Hospitalise the patient
> 130	Class V	Hospitalise the patient

Table 9.3.3(2): Classification of severity using PSI and recommendations for management[2].

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10 Management

Hamad Medical Corporation antibiogram data from 2017 demonstrates *Strep pneumoniae* is 99% sensitive to penicillin[14] [**L3**]. Based on this data, the treatments outlined in the following sections, have been recommended by the Guideline Development Group, for use in Qatar.

10.1 Outpatient Management of CAP

For patients with a CRB-65 or CURB-65 score of 0 or 1; or a PSI score of Class I-II, treatment will *usually* occur in the community, unless other considerations warrant admission[2,3,5–7].

10.1.2 First-Line Empirical Antibiotic Treatment

The recommended first-line empirical treatment of CAP in immunocompetent patients without significant comorbidities, is as follows [**R-GDG**]:

- Amoxicillin - as monotherapy for 5-7 days.
- If the patient is allergic to penicillin, use either clarithromycin, azithromycin or doxycycline as monotherapy.
- If an atypical pneumonia (i.e. pneumonia caused by an atypical pathogen e.g. *Mycoplasma pneumoniae*) is strongly suspected, consider using a macrolide either as monotherapy or in combination with amoxicillin.

In patients with significant comorbidities, commence empirical treatment with the antimicrobial regimen listed in *Section 10.2.2* below [**R-GDG**]:

10.1.2 Second-Line Empirical Antibiotic Treatment

If the patient is not responding to monotherapy after 48-72 hours of compliance with treatment (i.e. fever remains high, CRP has not fallen by 50%, or symptoms are deteriorating), reassess the patient's severity score and consider the following [**R-GDG**]:

- Whether the patient has a penicillin-resistant *Strep. pneumoniae* infection.
- Whether the patient has an infection with atypical pathogens.
- Whether the patient has developed complications; and
- Whether admission to hospital is appropriate.

If outpatient management is still warranted, use the following combination therapy [**R-GDG**]:

- Oral co-amoxiclav with a macrolide (e.g. clarithromycin or azithromycin).

If the patient is not responding to treatment begin investigations if available, otherwise refer to hospital for further assessment [**R-GDG**].

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10.2 Indications for Immediate Hospital Referral

Hospital admission should be considered for all patients with a CRB-65 or CURB-65 score of 2 or greater[3,5–7][**L1, RGA**] and in patients classified as Class III, IV or V on the Pneumonia Severity Index[2][**L1, RGA**](Refer to *Section 10.3*).

10.2.1 Antibiotic Treatment Prior to Immediate Referral to Hospital in Severe CAP

Administration of antibiotics prior to hospital admission, should be considered for patients with severe CAP, if there are likely to be delays of over 4 hours until admission[3,5,6][**L2, RGA**]. Recommended antibiotics for pre-referral treatment are [**R-GDG**]:

- First choice: IV ceftriaxone with a macrolide (e.g. clarithromycin or azithromycin); or IV co-amoxiclav with a macrolide.

- If IV drugs are unavailable and oral drugs are likely to be tolerated, consider using: Oral co-amoxiclav (high dose) with a macrolide.

10.3 Hospital Management

10.3.1 Criteria for Management in an Emergency Department or Short-Stay Ward

Observation care in the Emergency Department or on a short-stay ward, may be appropriate for patient with any of the of the following[8–11,13,43–46][**L1, RGA**]:

- Response to, or adherence to, outpatient therapy is uncertain.
- Patient with **ALL** of the following:
    - Intermediate-risk category patient (e.g. Pneumonia Severity Index Class III; CRB-65 or CURB-65 score of 2).
    - Absence of risk factors for a poor outcome (e.g. hypoxia, gross haemoptysis, cavitary infiltrate, immunocompromise, neuromuscular weakness, cystic fibrosis or TB).

10.3.2 Criteria for Inpatient Admission to Hospital

Inpatient admission to a hospital ward, is indicated for 1 or more of the following[8–13][**L1, RGA**]:

- Hypoxia as indicated by either:
    - Oxygen saturation less than 90% while breathing room air.
    - PO2 less than 8.0 kPa (60mmHg) while breathing room air.
    - Chronic lung disease with significant deterioration from baseline oxygenation.
- Outpatient treatment failure as indicated by either:
    - Failure to respond to antibiotic treatment (e.g. resistant organism).
    - Clinically significant adverse effects from medication (e.g. vomiting).
    - Complications of pneumonia (e.g. empyema, bacteraemia).
    - Significant worsening of comorbid conditions necessitating inpatient care (e.g. chronic heart failure).
- Appropriate diagnostic testing and treatment is unavailable in an outpatient facility (e.g. testing or infection control measures are unavailable).
- Significant pleural effusions.
- Hemodynamic instability.

- Intermediate-risk category patient who does not improve with initial therapy and observation (e.g. Pneumonia Severity Index Class III, CRB-65 or CURB-65 score of 2).
- Moderate-risk or High-risk category patient (Pneumonia Severity Index Class IV or V, or CURB-65 score of 3 or greater).
- Immunocompromised patient (e.g. patients on immunosuppressive therapies, AIDS).

Admission to ICU, is indicated by[8–13,47][**L1, RGA**]:

- A patient with acute respiratory failure.
- Haemodynamic instability not responding to fluid resuscitation.
- Any 3 of the following severity factors:
    - Respiratory rate 30 breaths per minute or greater.
    - PaO_2/FiO_2 ratio of 250 or less.
    - Multi-lobar infiltrates.
    - Confusion.
    - Blood Urea Nitrogen of 20 mg/dL (7.1 mmol/L) or greater.
    - WBC count less than 4000/mm^3 (4 x10^9/L).
    - Platelet count less than 100,000/mm^3 (100 x10^9/L).
    - Hypotension requiring aggressive fluid resuscitation.
    - Temperature less than 36ºC (96.8ºF).

Other criteria which may suggest the need for ICU admission include[2,3,5–7,11,47,48][**L1, RGA**]:

- PSI Class IV or V.
- CRB-65 or CURB-65 of 4 or more.
- Lactate >4 mmol/L (36 mg/dL).
- Arterial pH <7.3.
- Sodium <130 mmol/L.

10.3.3 Readmission Risk Factors

Risk of readmission is increased by presence of 1 or more of the following[49–64][**L1**]:

- Hospitalisation (non-elective) in past 3 months.
- 2 or more emergency department visits in past 6 months.
- Admission from a long-term care facility (e.g. nursing home).
- Prescribed antibiotics within 30 days of admission.
- Immunosuppression (e.g. malignancy, chemotherapy, systemic corticosteroids, AIDS).
- No source of outpatient care, other than emergency department (e.g. no primary care provider).
- Severe care transition barriers (e.g. no caregiver, homeless).
- Severe or end-stage renal disease (on dialysis or GFR less than 30 mL/min/1.73m2 (0.5 mL/sec/1.73m2)).

10.3.4 Antiviral Management in Observation Care or on an Inpatient Ward

If viral pneumonia is suspected, start treatment within 48 hours of onset with the following[65][**L1, RGA**]:

- Oral oseltamivir.

10.3.5 Antibiotic Management in Observation Care or on an Inpatient Ward

If the patient is to be treated empirically in an observation care setting (emergency department or short-stay ward), then the following empirical antimicrobial treatments are recommended **[R-GDG]**:

- IV co-amoxiclav with a macrolide (IV clarithromycin or azithromycin); or
- IV ceftriaxone with a macrolide (IV clarithromycin or azithromycin).

If the patient is allergic to penicillin, use the following regimen [**R-GDG**]:

- A respiratory fluoroquinolone e.g. IV moxifloxacin; or IV levofloxacin.

In all cases, treatment should be de-escalated where possible and in accordance with the results of microbiological investigations or according to clinical presentation and comorbidities. Consider a staphylococcal pneumonia in severely ill patients with a history of influenza[2–6][**L1, RGA**].

10.3.6 Antibiotic Management in the Intensive Care Unit (ICU)

The following antibiotic treatment is recommended as empirical first-line treatment in patients admitted to an ICU [**R-GDG**]:

- IV tazobactam and piperacillin, with a respiratory fluoroquinolone (e.g. IV moxifloxacin or IV levofloxacin); or
- IV meropenem with IV azithromycin.

If the patient is allergic to penicillin, use the following regimen [**R-GDG**]:

- IV aztreonam with a respiratory fluoroquinolone (e.g. IV moxifloxacin or IV levofloxacin) or
- IV tigecycline.

If the patient is at risk of infection with *pseudomonas*, consider adding an aminoglycoside (e.g. gentamicin) (see *Section 10.3.9*). If the patient is at risk of MRSA infection, consider adding either linezolid or vancomycin [**R-GDG**].

In all cases, treatment should be de-escalated where possible and in accordance with the results of microbiological investigations or according to clinical presentation and comorbidities[2–5][**L1, RGA**].

10.3.7 *Pseudomonas* Risk and Treatment

The following risk factors increase the probability of an infection with *pseudomonas*:

- Structural lung disease (e.g. COPD, bronchiectasis).
- Oral prednisolone therapy of >10mg/day.
- Malnutrition.
- Recent hospitalisation and antibiotic therapy for community acquired pneumonia.

If *pseudomonas* infection is suspected, treat empirically with the following treatment [**R-GDG**]:
Use an anti-pseudomonal beta-lactam together with the following antimicrobials:

- IV ciprofloxacin; or
- IV respiratory fluoroquinolone (e.g. moxifloxacin or levofloxacin) and an IV aminoglycoside (e.g. gentamicin); or
- IV macrolide (e.g. clarithromycin or azithromycin) and an IV aminoglycoside (e.g. gentamicin).

Anti-pseudomonal beta-lactams include:

- Cefepime.
- Tazobactam and piperacillin.
- Meropenem or imipenem.

If the patient has a history of allergy to penicillin, use:

- Aztreonam with either: moxifloxacin or tigecycline.

In all cases, treatment should be de-escalated where possible and in accordance with the results of microbiological investigations or according to clinical presentation and comorbidities[2–5][**L1, RGA**].

10.3.8 Duration of Treatment and Conversion to Oral Antibiotics

If admitted to hospital, patients should, in general, be treated for 7-10 days in total. A longer duration of treatment is usually necessary in complicated cases or where a *pseudomonas* or *legionella* infection is suspected [**R-GDG**].

The patient should be converted from intravenous to oral antibiotics, as soon as possible but only if the following patient factors apply[3,5][**L1, RGA**]:

- The patient has been fever-free for 24 hours.
- The patient is:
    - Oxygenating well.
    - Haemodynamically stable.
    - Tolerating oral intake.

Glucocorticoids (prednisone for 7 days) could reduce hospital stay, however, further studies are needed to evaluate the long term adverse events and the significance of hyperglycaemia associated with the treatment[66–73] (**L1-RGB**).

10.3.9 Criteria for Discharge from Inpatient Care

Patients may be considered for discharge from hospital if the following conditions have been met in the preceding 24 hours of admission[3,5][**L1, RGA**]:

- Temperature less than 37.5°C.
- Respiratory rate less than 24 breaths per minute.
- Heart rate less than 100 beats per minute.
- Systolic blood pressure greater than 90 mmHg.
- Oxygen saturation greater than 90% on room air.
- Mental status within normal limits or at baseline.
- Able to eat without assistance.
- Adequate discharge destination.

10.3.10 Follow-up

All patients should be reviewed by their primary care physician within one week of an episode of CAP, in which hospital admission was indicated. Specialist supervision is indicated in cases where comorbidities or complications are present [**R-GDG**].

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An appropriately detailed discharge summary should be sent from the admitting hospital to the primary care physician in all cases of emergency department attendance, admission to observation care or admission to an inpatient ward or ICU [**R-GDG**].

At the follow-up appointment, consider the following:

- A repeat chest radiograph 4-6 weeks after discharge, in patients at high risk of malignancy, e.g. heavy smokers[1][**L2**].
- Administration of the pneumococcal vaccine in all patients where inpatient admission for pneumonia was deemed to be necessary [**R-GDG**].

11 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.

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12 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.

Number	Numerator	Denominator
CAP01	Number of patients with a recorded CRB-65, CURB-65 or PSI score recorded.	All patients with a recorded diagnosis of CAP.
CAP02	Number of patients who receive an initial antibiotic regiment consistent with current National Guidelines during the first 24 hours of hospitalisation.	All immunocompetent patients with a recorded diagnosis of CAP aged 18 years or older who were not admitted to ICU.
CAP03	Number of patients with a diagnosis of CAP who receive a first dose of antibiotics within 4 hours of presentation to the hospital.	All hospitalised patients with a recorded diagnosis of CAP.

Table 12.1: Performance Measures.

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Appendix: Detailed Description of the Literature Search

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 pneumonia diagnosis and/or management was performed in the *PubMed* database and websites of relevant organisations and societies. The present guideline is primarily based on UK NICE guidelines, UK National Clinical Guideline Centre guidelines, British Thoracic Society guidelines, American Thoracic Society guidelines and American College of Physicians guidelines and is supplemented with other relevant studies.

The included publications were identified using the term "Pneumonia" and specified with the following terms in combinations:

guidelines, disease, adolescents, adults, pneumonia, community-acquired, admission, management, emergency, treatment, diagnosis, referral, discharge, testing, readmission, antibiotic, antibiotic resistance, empirical antibiotic, oral antibiotic, first line, second line, length of stay, complication, prognosis, intensive care unit, lower respiratory tract infection, risk scoring system, respiratory virus, streptococcus pneumoniae, mycoplasma pneumoniae, oxygen saturation, hypotension, cyanosis, cough, tachypnoea, tachycardia, glucocorticoids, vaccine, vitamin D.

Furthermore, to investigate any emerging evidence, the literature has been searched as described in the below mentioned diagram:

View Pathway

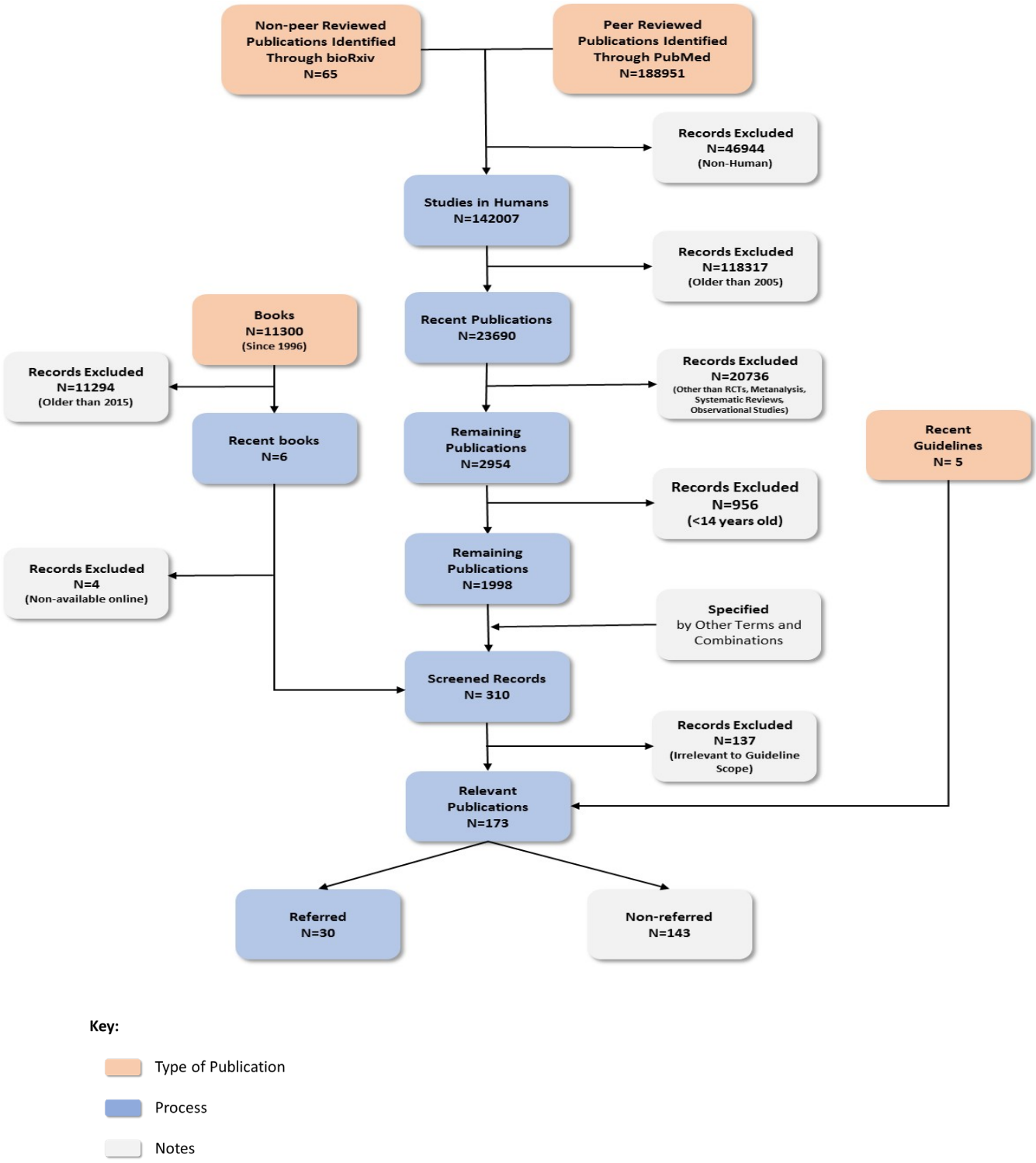

Fig A.1: Literature search results and application of exclusion criteria.

View Pathway

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